AMERICAN GAS ASSOCIATION MONTHLY

JANUARY · 1936

Gas Industry Gains in 1935

•

Electric and Gas Cooking Costs

E. O. SIPPEL

•

Junior Water Heater Service

W. F. McCREERY

•

Gas Measurement Report Data

1935
Natural Gas Department Proceedings

272 pages
cloth bound
illustrated

PAPERS, REPORTS
ADDRESSES AND DISCUSSIONS
PRESENTED
AT ANNUAL MEETING
MEMPHIS, TENN.
MAY 6-9, 1935

Price $2.00 to members
$4.00 to non-members
LIMITED EDITION

What possibilities does air conditioning offer the natural gas industry? Read the answer by five prominent men in the 1935 Natural Gas Proceedings.

Is there need and justification for adequate natural gas reserves and conservation? Turn to page 49—four experts discuss the question.

Is whole organization attention to sales a vital necessity? Pros and cons begin on page 94.

Are you interested in the use of gas engines for power? A symposium on this subject starts on page 149.

Do you have difficult problems of production, such as control of gas wells, directional drilling and natural gas storage? If so, pages 174 to 209 will interest you.

Is dehydration of high pressure natural gas one of your pet problems? Three engineers present their theories and practical experience beginning on page 216.

Are other problems of transmission and compression bothering you? Read what has been done by men on the firing line.

Are you familiar with the research projects under way to improve the position of the natural gas industry? It's your problem, why not start with all of the information available?

Order your copy of the Natural Gas Department Proceedings now.

ADDRESS:

AMERICAN GAS ASSOCIATION
420 Lexington Avenue
NEW YORK, N. Y.

AMERICAN GAS ASSOCIATION MONTHLY

Contents for January 1936

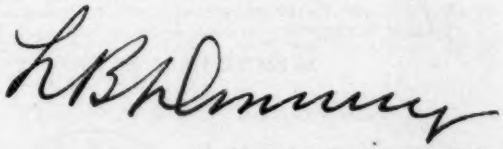
VOLUME XVIII NUMBER 1

Published monthly by the American Gas Association. Publication Office, American Building, Brattleboro, Vt. Editorial Offices, 420 Lexington Avenue, New York, N. Y. Address all communications to 420 Lexington Avenue, New York, N. Y. The Association does not hold itself responsible for statements and opinions contained in papers and discussions appearing herein. Entered as Second Class Matter at the Post Office at Brattleboro, Vermont, February 10th, 1922, under the Act of March 3, 1879.

SUBSCRIPTION RATE : $3.00 A YEAR

A NEW YEAR'S MESSAGE

WHAT the year ahead holds for the gas industry and those whose lives are inextricably interwoven in its destiny, none is so foolish to predict. Change is the only thing that is certain and if there is one thing today which above all else stands out as insuring a change for the better it is the fact that our industry has based its hope of achievement and prosperity upon positive co-operative effort and not upon isolated and disunited endeavor. It has been said that the distinguishing mark of intelligence is the ability to cooperate. It is upon cooperation that your association is founded; it is upon cooperation that its future, the industry's and yours, depends. We have a common objective, common responsibilities, and common difficulties which will only be solved by common effort. Our resources, tested by time and experience, together with a strong spirit which is manifesting itself, can have but one, inevitable result. Our ability to work together in harmony and a spirit of mutual helpfulness will determine to a large degree the measure of our success in the coming year.



President, American Gas Association.

AMERICAN GAS
ASSOCIATION
MONTHLY

James M. Beall, Editor

Gas Industry Makes Gains in 1935

DURING the year 1935 the gas industry in the United States continued the improvement which began in the previous year. Not only did the industry gain in revenue and sales but it continued with unabated vigor the broad research program carried on in many directions to develop new and improved uses for gas fuel. In addition the past year brought into bold relief the new spirit which has surcharged the industry in every section of the country. This spirit which is so much in evidence today is one of united, cooperative and aggressive effort to promote the sale of gas and gas appliances in the most modern and effective way.

Abundant evidence of the strides made in the past year is contained in the annual statistical review of the industry compiled by the Association's statistical department. More than any other one factor there is cause for optimism in the increased sale of gas ranges. In spite of an intensive campaign carried on by the electrical industry to supplant the gas cooking load, the sale of gas ranges increased nearly 30%.

Approximately 1,100,000 gas ranges were sold during the year, which is more than the total number of electric ranges in use in this country today. This represents a gain of 250,000 over the previous year's sales. While the sale of electric ranges increased also over the previous year as a result of the concentrated advertising and promotional campaign, a considerable number of these sales were made in territories not supplied with gas. It is a significant fact that nearly 75% of the gas range sales constitute relatively high-priced ranges incorporating modern automatic features, such as oven heat control.

A striking advance was registered in the field of gas refrigeration, 1935 figures showing a gain of 56% in the sales of gas refrigerators over 1934.

Advertising Pledges Reach Half-Way Point

PLEDGES in support of the proposed three-year advertising program for the promotion of gas as a modern fuel for domestic, commercial and industrial purposes have been received from companies having 5,535,291 meters in service. This is 50.3% of the quota of 11,005,400 meters which represent 70% of the 15,722,000 meters in service by the entire industry.

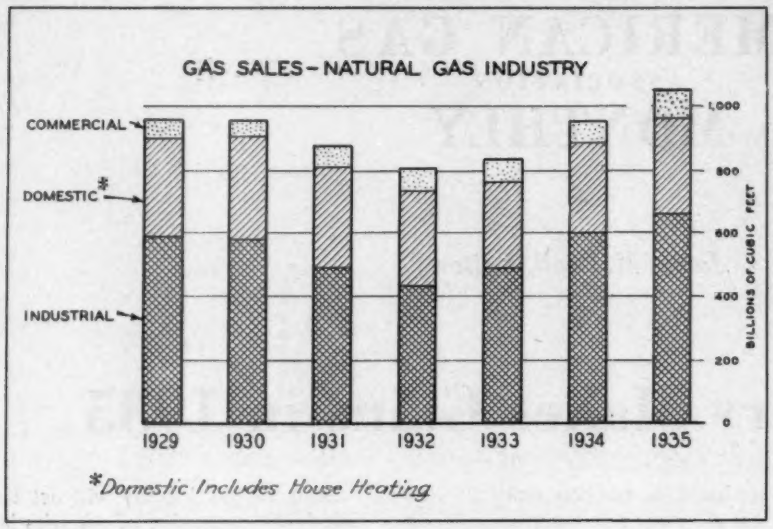
The members of the Committee on National Advertising, headed by Herman Russell, of Rochester, New York, vice-president of the Association, are entirely satisfied with the results secured so far and are now directing their efforts to contacting many of the companies that have not yet executed the pledge. The present program of national advertising for which the industry's support is now being solicited was proposed in an address delivered October 16 at the Chicago convention by James F. Pollard of Seattle, representing the Pacific Coast Gas Association. The following day the Executive Board of the American Gas Association, by resolution, gave the project its enthusiastic support, and the industry was circularized on November 14 and 19. The total meters pledged at the date this is written, Dec. 26, have been secured in a period of slightly more than sixty days.

(Continued on page 5)

That the gas industry will not be idle in the promotion of gas sales in the vital domestic field, is apparent in the plans now under way or contemplated for 1936. Sponsored by the Commercial Section, three national sales campaigns to promote the sale of gas ranges, gas water heaters, and gas refrigerators will be conducted on a scale not attempted before by the industry. The refrigerator and range campaigns conducted in 1935 were considered outstanding successes and with the experience gained and the greater advertising contemplated, this year's results are expected to be far more satisfactory. This will be the first year in which a national campaign involving water heaters has been attempted and it is expected to greatly increase the sale of this important appliance.

Of special interest in increasing the sale of domestic appliances during the coming year, is a study being undertaken on a nationwide scale of long-term financing of appliance sales. Existing plans and programs of gas companies and individual dealers will be reviewed in an effort to complete successfully on equal terms with competitive industries.

One of the more recent projects which is expected to have an important bearing on future domestic sales is the institution of a domestic gas appliance research study by a special committee of the Association. It is felt that the competitive situation calls for a broad and complete appraisal of the position that domestic gas appliances occupy today and an accurate



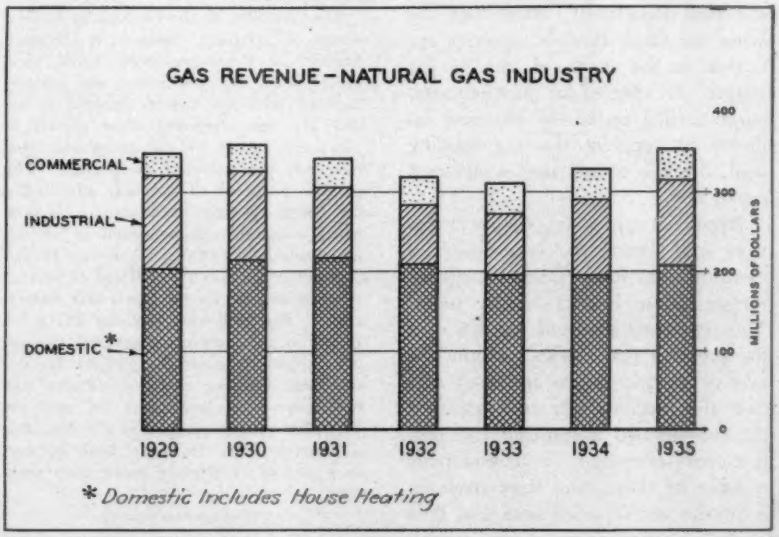
understanding of whether present apparatus is adequate to compete successfully with other fuels. The committee has taken full cognizance of the splendid advances that have been made by manufacturers in designing and building modern appliances and has carefully reviewed the improvements in construction, performance and dependability that have steadily taken place since the Laboratory Approval requirements were first drawn up some ten years ago. Detailed consideration is being given first to ranges, and findings of considerable importance are expected to be released in 1936.

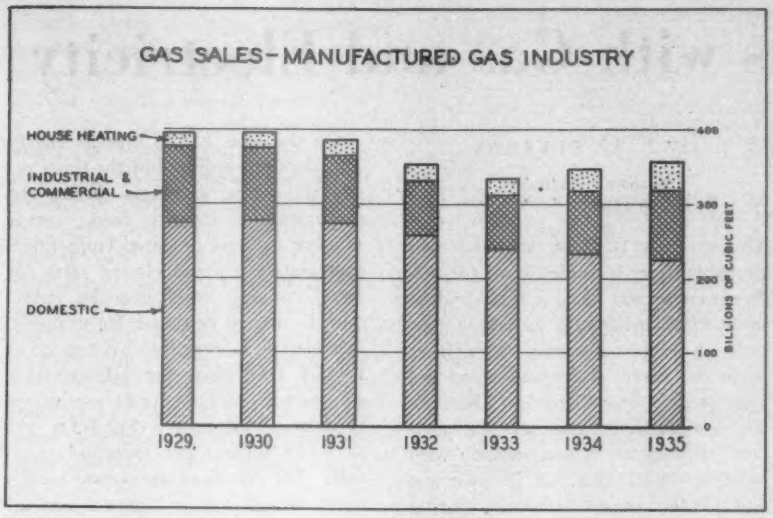
To augment and support the sales campaigns and research work in the domestic field and to increase consumer acceptance and preference of gas fuel, it is hoped to inaugurate within the next year a national advertising campaign. A strong movement in favor of this project developed at the annual convention last October and the industry is now being contacted for support. With a quota of 70% of the meters in the entire country necessary to proceed with the project, at this writing half of this quota has been pledged and additional pledges are arriving daily. Companies situated in 32 states have already agreed to support the campaign.

The trend toward greater advertising is reflected in the latest available figures showing advertising expenditures of gas companies in 1934. During that year expenditures of reporting manufactured gas companies increased 26 per cent over the preceding year. Expenditures of natural gas companies increased by almost the same amount, or 22.4 per cent. A significant feature of the figures is the fact that publicity and advertising expenditures devoted to new business purposes amounted to approximately 77 per cent of the total.

To those in touch with advertising developments within the industry and particularly those who have an opportunity to see the various kinds of advertising that are being done, the most striking change is in the strong copy appeal of the advertising itself and the very modern manner in which the art work is executed. A review of such advertising today brings forth the observation that the gas industry is presenting its product and its appliances in a way that is equal to the most enlightened practice in the advertising business. Particularly noticeable is the improvement in copy used by companies facing strong competitive conditions. The statements in behalf of gas fuel are no longer as modest as they once were; they are forthright, strong declarations of the superiority of gas.

The inauguration of the Mystery Chef radio program by some 89 companies in the eastern part of the United States does not represent by any means a full perspective of the industry's use of this ultra-modern medium. Many gas companies are making most excellent use of local radio facilities and not a few have effective promotional programs on stations giving a full coverage of their meters in service. Motion pictures are also in popular use. In the Tennessee Valley area the use of two- to three-minute films announcing special sales of gas appliances has been found extremely effective. The character of direct mail advertising as distinguished from newspaper advertising, has undergone a noteworthy improvement. Syndicated advertising appears to have had its day and companies no longer prefer to depend on so-called "canned" copy. Where management is most progres-





sive the advertising is either done within the company itself by a competent advertising man and staff or the services of advertising counsel are secured. The result is that the advertising has a localized and personalized touch that means so much in winning sales.

The credit for these improvements in advertising belongs in no small degree to the executives of gas companies who now take a keen interest in matters of an advertising nature. All of these changes are having a beneficial effect on employee sentiment and are helping to build up and sustain employee interest in selling appliances. Some of the best gas company advertising appearing in the newspapers today is sponsored by companies whose employees are active merchandisers of appliances.

One of the most encouraging facts shown in the statistical review of the gas industry, is the increase in total number of customers served. Manufactured and natural gas companies, supplying towns and cities with a population of 80,000,000, served a total of 16,002,000 customers, representing the largest number of consumers ever connected to the mains of the industry. Of these, 9,973,000 were served by the manufactured gas industry and the remaining 6,029,000 were served by the natural gas industry.

Revenues of the entire industry, both manufactured and natural, aggregated $726,306,000, a gain of 3.4 per cent over the preceding year of 1934. The natural gas companies grossed $353,335,000, a gain of 7.8 per cent for the year, while revenues of the manufactured gas companies were $372,971,000, as compared with $374,845,000 in 1934.

While the sales of manufactured gas for domestic uses, other than house heating, declined 3 per cent for the year, the sales of natural gas for domestic use registered a pronounced upturn, rising from 284,482,000,000 cu.ft. in 1934 to 302,120,000,000 cu.ft. in 1935, a gain of 6.2 per cent.

House heating sales again made a striking advance, registering a gain of 29 per cent over the previous year. Higher heating efficiency and lower rates are important factors contributing to the increased use of gas for this purpose. With many companies adopting promotional rates and making tremendous efforts to capitalize on this potentially large load, the rising curve of house heating sales is expected to continue.

Keeping pace with quickening industrial activity, sales of both manufactured and natural gas for industrial and commercial purposes in 1935 averaged about 10 per cent above the previous year. This progress is unquestionably due, in part, to improvement in the utilization of gas for industrial heating processes, brought about by a continuing program of research sponsored by the Association. Examples of modern gas heating installations are now to be found in virtually every line of industry and for a wide and varied range of processes numbering well up in the thousands.

NATIONAL ADVERTISING

(Continued from page 3)

Companies situated in 32 states have signed the pledge. Manufactured gas, natural gas, and combination gas and electric companies are among those who have expressed a desire to contribute to and participate in the proposed campaign. In several instances, pledges have been returned bearing unsolicited comments reflecting confidence in the benefits to be derived from a national advertising effort and expressing the hope that the gas industry will lose no time in getting the program under way. Some of these comments are as follows:

"It's a pleasure to support this program." "This company heartily approves the proposal that there shall be a national advertising campaign designed to procure public acceptance of gas as the best, most modern as well as the most economical fuel for all domestic and industrial purposes." "This is a move in the right direction by acquainting the public with the fundamental facts of the economy of the use of gas." "The program can not help but be of considerable help to the industry as a whole." "We hope you will find it possible not only to put over the plan you have in mind but will perpetuate the movement." "Unquestionably we have something worthwhile to sell, so why not tell the people about it?"

In asking for support for the program, Mr. Russell's committee has not committed itself to specific types of copy, media, or any other details. These will be left to a competent group or committee which it is proposed to select at a later date by vote of the contributing companies, provided the 70% quota is obtained. The form of pledge which companies are now asked to execute reads as follows:

"We heartily approve the proposal to supplement our local load-building advertising by means of media of national circulation, and in support of the proposed three-year industry campaign for the promotion of gas as a modern fuel for domestic, commercial and industrial purposes, we hereby pledge a contribution for the year 1936 of not exceeding 4¢ per meter in service on our lines. This pledge is conditioned upon participation on the same basis by companies serving not less than 70% of the active gas meters in the industry."

Cooking Costs with Gas and Electricity

F. O. Suffron

By F. O. SUFFRON

Research Engineer,
A. G. A. Testing Laboratories

ALTHOUGH much has been said in the press of the nation concerning the relative merits of domestic gas and electric ranges from standpoints of speed of operation, flexibility, convenience and cleanliness, the fact remains that possibly the chief item of concern to most consumers is the relative cost of cooking with the two fuels. From this viewpoint, as from the many others, gas possesses an undeniable superiority over electricity. A few moments of careful thought will substantiate this statement. Scientific laboratory tests have already proven it.

In dealing with the cost of cooking, one is concerned primarily with the production of heat and its transfer to food products. While nothing in this article should be construed to mean that electricity cannot be effectively utilized for such purposes, it can be demonstrated that the cost of producing and delivering a B.t.u. of energy to the kitchen in the form of electricity is in general much higher than the cost of serving the same energy in the form of city gas. The problem, therefore, becomes one of economics.

Laboratories' Study

The Testing Laboratories of the American Gas Association in the spring of 1935 completed an investigation which constitutes the third study within the past few years of the comparative performance characteristics of domestic gas and electric ranges. This latest investigation was probably the most comprehensive scientific study ever undertaken on the subject, and the report covering it presents authoritative data on the subject of energy consumptions and, consequently, cooking costs.

Operating costs are, obviously, dependent upon two factors: The quantity of heat required for cooking processes and the cost of each heat unit. The quantity of heat required will probably differ to some extent for different consumers since it is dependent upon many items such as family size, taste and type of menu, as well as upon the make of appliance and the care used in its operation. Likewise, the cost of heat units as purchased from utilities varies considerably with location. Each area has its own gas and electric rates. However, during the Laboratories' research, it was possible to conduct tests in such a manner and collect survey data of such an extensive nature, that the effects of these two main items of range operating cost could be either eliminated, controlled, or measured.

Identical Meals Prepared

In order that none of the factors possibly introduced as a result of varying heat quantity requirements of different families might affect the Testing Laboratories' results, many precautions were taken. Identical menus were prepared on each of three current popular models of gas and three electric ranges under the supervision of Miss Dorothy Shank, director of the American Stove Company's Research Kitchen. Weights of foods, temperatures, times of operations, and energy consumptions were determined precisely. In fact, utmost care was exercised throughout the investigation to insure that results obtained were accurate and truly reflected the performance abilities of modern gas and electric ranges.

Two separate menus, each consisting of meals for four persons for seven days, were used during the investigation. The first series of meals was typical of a family having an income somewhat above average and representing a class normally able to afford the first cost and high operating expense of electric ranges. The second week's menu consisted of meals designed for a similar family in a much lower income bracket.

On the basis of the average energy consumptions required by the three gas and three electric ranges during the preparation of the first menu, curves (Figure 1) were prepared from which comparative gas and electric rates for equal cooking costs may be determined. It will be noted, for example, that electric rates would have to be as low as 1.57 cents per kilowatt-hour to provide cooking costs equivalent to those afforded by a 532 B.t.u. gas at 1.175 dollars per thousand cubic feet. The results of the second week's menu are plotted in Figure 2 and indicate that operations performed with 1.175 dollar gas can generally be duplicated at equal economy with electric energy only if that energy sells for 1.36 cents per kilowatt-hour, or less. As the cost per therm of gas becomes smaller, the price at which electricity becomes competitive for cooking operations is also reduced until it becomes extremely low.

Charts Show Costs

Hence, to determine the relative cost of cooking identical meals with gas and with electricity in any locality, it is merely necessary to employ the two charts here presented applying the local gas and electric rates for domestic cooking. In cities of 50,000 population and over in the United States, the average gas and electric rates (weighted in proportion to the number of meters in each city) are such that it costs 2.39 times as much to cook by electricity as to cook by gas. In some localities, the advantage of gas over electricity is much greater than this; in others it is less. Local natural gas situations, hydroelectric power situations, and special municipal rate schedules alter the picture from city to city, but the average figure of two and one-half is fairly representative of the country as a whole.

Cost of energy is only one of the items which should enter into a complete analysis of the cost of operating a kitchen range. The first cost of the appliance is of extreme importance since it represents a definite capital outlay for the household. Although

recently there has been considerable pressure brought to bear on manufacturers in an effort to bring the cost of electric ranges down to the level of gas ranges, there is still a wide difference in prices. Studies of the retail charges for numerous similar models of each variety indicate that an electric range which compares favorably with a modern gas range in appearance, style, size, capacity and utility will cost nearly twice as much. Furthermore, its installation is much more difficult and this added cost must be ultimately borne by the purchaser whether it be billed as such or whether it be included in the sales price of the appliance or the cost of energy.

Maintenance Cost

Maintenance cost is also an important, although frequently overlooked, factor. Important points of difference between gas and electric ranges which might affect maintenance costs are the heating units and the conduits for supply of energy. Gas piping on a range has an exceedingly long life expectancy whereas the life of the insulating materials enclosing electric wires is much more limited. The most pronounced difference between gas and electric ranges from the standpoint of maintenance lies, however, in the probable life and replacement costs of heating units.

Gas ranges with the original burner equipment have been in continued service upwards of twenty-five years. Almost invariably gas appliances outmoded after years of service possess the original burner equipment in a fine state of repair as regards satisfactory performance. The life of electric elements is, on the other hand, limited. One top element of each of three ranges was allowed to operate continually with the result that one element burned out after 1,300 hours. Considering that elements in actual service are subjected to conditions of usage not less severe than were imposed during this test, it may be logically inferred that actual life of this element would be less than two years. The most optimistic statement regarding life is found in a manufacturer's advertisement (Electric, Light and Power, August, 1934), emphasizing the durability of their top units which said that "Accelerated life tests indicate an average life of 7½ years." Not only do gas burners seldom, if ever, warrant replacement, but they yield the same high level of performance throughout their entire life. Tests made by the National Bureau of Standards (Technical Paper 222) show that the performance of gas ranges which have been in service for several years was as satisfactory as that of a new range. This condition does not hold for electric ranges. Tests made during the Laboratories' investigation showed appreciable reductions in electric top unit efficiency after short accelerated service tests.

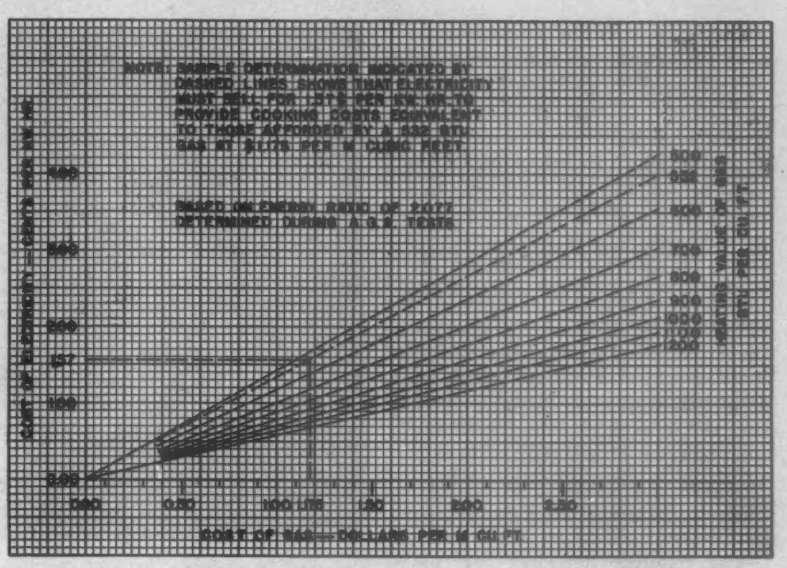


Figure 1—Comparative gas and electric rates for equal cooking costs

Deterioration

The prospective purchaser of an electric range is confronted, therefore, with the possibility of incurring considerable expense at the end of a few years for the replacement of top elements. In any event, as the elements deteriorate with age and usage, efficiencies drop and operating costs become greater.

In the past, others have attempted to offset the rather marked economic and other advantages of cooking with gas by introducing collateral factors, such as shrinkage of foods, deterioration of kitchen walls and hangings, etc., based on fallacious conceptions of heat transfer and products of combustion. The shrinkage of foods, particularly oven-cooked meats, is a subject which competitors' salesmen, either ill-advised of the facts or unwilling to accept them, have frequently discussed. Such exaggerated statements as "Save $52.00 per year on your meat bill alone" have been prominently displayed in front of electric ranges with the evident intent of inferring that meat cooked by electricity shrinks less than meat cooked by other methods. For the engineer accustomed to thinking of heat transfer in terms of radiation, convection and conduction, it is difficult to appreciate the effect on the layman of the representatives of a great industry inaccurately telling him that when electricity is used his food will be better flavored and will cost him less.

Weight of food in oven cooking is lost through evaporation of moisture, and evaporation is proportional to temperature. It seems logical, therefore, that with equal temperatures in two ovens, one heated by electricity and the other with gas, the loss of weight will be the same in the same period of time. Furthermore, this contention has been borne out through numerous tests and investigations. The University of Missouri reports in Bulletin No. 293, issued by the College of Agriculture, Agricultural Experiment Station, November 1930, that the average shrinkage of meat for ten

methods of roasting prime ribs of beef to an internal temperature of 135° F. is 6.79, 15.83, 18.69, 25.76 and 30.44 per cent by weight for oven temperatures of 230, 325, 375, 425 and 500° F. respectively. It will be found by plotting these percentages of shrinkage against the corresponding oven temperatures that a straight line is defined, indicating shrinkage to be proportional to oven temperature.

During the Testing Laboratories' investigation it was found that average shrinkages of foods observed for all individual tests, including roast chicken, rolled roast beef, meat loaf, and standing rib roast of beef, were 21.43 and 19.54 per cent for electric and gas ranges respectively.

The frequent statement that gas cooking by virtue of the fuel used causes discoloration of kitchen walls and cooking utensils is not borne out by actual practice and was refuted in an article by R. M. Conner in AMERICAN GAS ASSOCIATION MONTHLY, May, 1935. Any heating process whether by steam radiation, electricity or gas causes warm air to rise by convection and circulate through the room. Such currents may, of course, carry grease or dust and in time deposit noticeable quantities of it on walls, but this results from heat and not from the manner

Consumptions of energy, times of operations, temperatures and weights of foods were precisely measured for each cooking operation

in which that heat was liberated. From the standpoint of cleanliness, absolutely no advantage of the electric range over the gas range can be seen. As a matter of fact, oven sections of electric ranges are seldom vented to the outside atmosphere; whereas gas range ovens, on the other hand, are frequently connected to a chimney flue. Field and laboratory experience positively indicate that gas cooking is no less satisfactory than electric cooking from the standpoints of either cleanliness or initial maintenance and operating costs.

The estimated 15,000,000 gas ranges in use in the United States today serving more than half of our population attest to the satisfaction and economy of gas cooking. The logic of the matter substantiated by laboratory tests gives actual proof of the advantages of gas over electricity from many viewpoints. It should not be necessary for the gas industry to fall into the errors of its competitors in making exaggerated, unprovable statements regarding their products. If the true and demonstrable capabilities and economies of both gas and electric cooking are fairly presented to the public, the public will make its choice quickly. That choice, in the vast majority of cases, will, undoubtedly, continue to be in favor of gas.

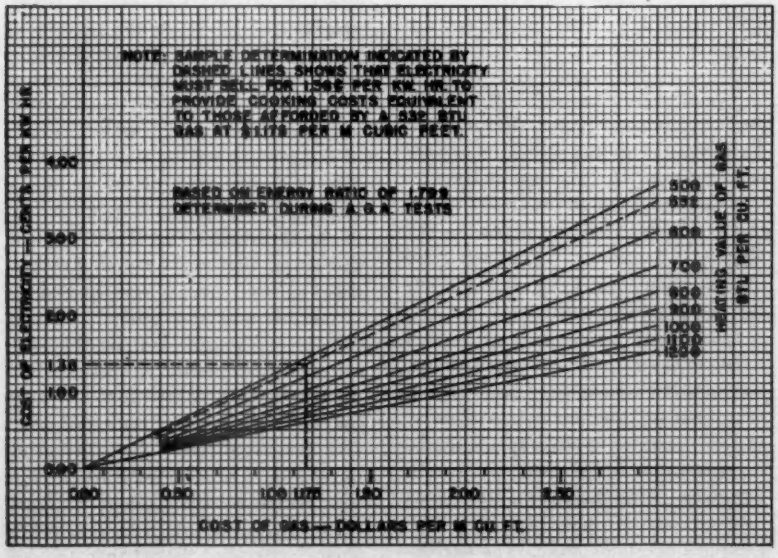


Figure 2—Comparative gas and electric rates for equal cooking costs (for families of limited income)

McCarter Medals Awarded

TWO McCarter medals and one certificate of assistance were presented recently to service men of the Northern States Power Company, St. Paul, Minn., for conspicuous work in life saving by application of the Schafer prone pressure method of resuscitation. Medals were presented to Emmett Colaizy and William Curran and a certificate of assistance to Leo Carroll. These men were instrumental in reviving four persons overcome by gas which leaked into two houses.

Radio Audience Welcomes Mystery Chef

THE first response of the public to the radio program sponsored by 89 Eastern gas companies and featuring The Mystery Chef has been an enthusiastic one. And this despite the fact that so-called "fan" mail has been discouraged. (For a complete description of the program see the A. G. A. MONTHLY for January.)

In each broadcast up to and including December 15, special mention was made that the 100-page recipe book to be distributed in connection with the radio program could be obtained by applying at the offices of the gas companies supporting the program. It was specifically requested that listeners should not write to The Mystery Chef for the book or write to the gas companies or their dealers for it. Despite these instructions, companies have had plenty to do to take care of mail and telephone requests, to say nothing of women customers who have applied in person for the book.

Recipe Book in Demand

Shortly following the broadcast on Friday, December 13, the district offices of a large Eastern gas company were comfortably filled during the day with women who had earlier that day listened to The Mystery Chef's recipe for baking fish. It was a cold, blustery day. Several hundred women were so impressed by the recipe and so eager to obtain a copy of the book despite the injunction that it was not ready, that they walked or went by street car, bus or automobile to the nearest district office. When asked why they had gone to such trouble to call for the recipe book when it was specifically stated that the book was not available, the answer invariably was "I know all about that, but I wanted to make sure that I am going to get my copy."

In the case of a northern New York company which advertised the radio program prior to its start, the company was deluged with telephone calls immediately following the first broadcast, and the interest in the program has been sustained ever since in that particular vicinity.

Doubtless the large amount of listener interest in the program comes from the substantial following created by The Mystery Chef in his previous series of broadcasts, but no little portion of this response, reflected by letters and telephone calls and personal visits, is due to the appeal of the present series, and particularly the interest manifested by women in recipes—an interest which is far greater than is generally realized. Announcements that gas companies situated in the territory from Washington, D. C. to Portland, Me., were sponsoring the program, have served to cut down requests from individuals outside of the present broadcasting area who have sets modern enough to pick up the program as it goes over some of the larger of the thirteen radio stations now being used. Nevertheless, Several such requests are now arriving for the recipe book.

One of the first letters to be received from an interested listener was from a young girl in New Jersey.

"I have heard in your recent broadcasts about your new cook book 'Be An Artist At the Gas Range,'" she wrote. "Won't you please send me the cook book? I am anxious to try your recipes. I don't have a gas range at present but expect to get one sometime later.

"I know how true your recipes are. I have tried many of them given in your old cook book of excellent recipes, the most treasured cook book of all the cook books I own.

"I have never missed your radio program since the first time I heard you on the air. You see your recipes and tips are very helpful to me. My mother passed away five years ago and left me to take care of two brothers and two sisters younger than myself. I was only 12 years old, but I managed somehow. My friends think I am a born cook whenever I serve them cake or pies—high, light, and just melt in your mouth. Some of them don't believe I made it until I show them your book of excellent recipes. I am proud of my cooking and baking. I haven't bought a cake at my bakers for two years. Why should I when our family says they like homemade cakes and pies because they are better, more moist and fresher."

Other comments, picked at random and typical of the kind of mail that is now being received are:

"I am one of your old friends and will be at my radio to welcome you back to the air. Lots of good luck on your new program." "All in my family are delighted at hearing you broadcast again. We have missed you very much. Hope you will be on the air for a long time with no interruptions." "Very nice hearing your voice again, but I live in the country and does that mean I am not to have your new book? Oodles of luck to you." "Welcome back over the air. I am very happy to listen to your genuine talk and excellent recipes which help me so often to good meals." "So glad you are on the air again. The fish on Friday sounded good but when you mentioned black pepper it is all off with me, as pepper and I don't agree. I use paprika and no matter where I have cooked I am always told I season things just right and no pepper either. I wish you good luck, also in advance Merry Christmas and a Happy New Year." "I certainly was glad to tune in on my radio and hear that you are back on the air again. Am certainly going to get the book 'Be An Artist At the Gas Range' as soon as I go to my gas company. I treasured your former book so much. I never even loaned it to anyone, but now I am lost without it for a woman came over to borrow some recipes a few months ago and without my knowledge walked off with my Mystery Chef cook book also."

"I am one of the fortunate ones to tune in on time to hear your first broadcast. I have just tried the scones and they are delicious. I am afraid I will have to make

them every morning for breakfast." "My husband and I send you a hearty welcome back to the air! We have missed your broadcasts very much indeed, and I was more than delighted when my husband said he had noticed you 'on the air' once more. Unfortunately we were out Wednesday morning so missed your first broadcast. However, from now on I shall make my shopping day down town any day but Wednesday and Friday!" "Because of illness I have no chance of being 'a wizard' at the stove at present, but my sister and I turned to your scones in your own cook book this morning and followed your all-to-brief first talk over the air. Welcome back! It is delightful to hear you again and we appreciate the excellent psychology of your radio talks. Greetings!" "My son tuned in to your broadcast this morning and I wish you might have seen the glance of satisfaction we exchanged at the sound of your voice again. My son has told each and every one of our acquaintance what you tell on the radio about cooking."

Accent Makes Her Homesick

"I often listen to your interesting program. Your English accent sure makes me homesick." "Thank goodness you are back on the air, I have had perfect success with your books and recipes. Your suggestions are so easy to follow. I shall listen with interest to your broadcasts. From one Scot to the other." "It was so nice to welcome your return to the air last Wednesday. The recipe for Scotch scones was lovely—made them that very evening. I am happiest in my kitchen cooking new and delicious dishes for my family." "I am so delighted to have you on the air again with all your splendid philosophy and excellent recipes. Of course, I agree with you on the superiority of gas cooking. Also grand is our instantaneous gas water heater and Electrolux." "Your broadcasts are most helpful. Never yet have I had a failure from one of the recipes you have given. They are big successes." "You mentioned a very important factor, the oven with heat control. Can safely say if all stoves were equipped with heat control the average housewife and homemaker would use the kitchen to a larger extent."

"I have cooked for my family for many years and acknowledge much good, valuable and interesting recipes and advice from your broadcasts." "I am just starting housekeeping and have been told your helpful cook book will help me solve my ever increasing problems." "May I express my enthusiasm for your return to the air? I have always enjoyed your broadcasts and regretted your withdrawal last year." "Still in possession of your former cook book. I want to state that I learned cooking at the age of sixty years and it is the only cook book I was able to follow. Every recipe was a success, and now I am ready for your new book. Needless to say we all welcome you back to the radio, and I may say of all the frigidaires I have had in different apartments, the Electrolux is outstanding and economical."

In his Christmas Day broadcast The Mystery Chef took occasion to explain how the present series originated. That portion of his Christmas Day message follows:

"Now, let me tell you the story of how this whole series of broadcasts was brought about and how a large part of an industry was brought together through the actions of one little boy, 10 years of age. Think of how your life may affect others without your knowing that what you say or do is having any effect on this world. Something you do or say today may effect the lives of others . . . . not only in America but in lands beyond the seas.

"Here is the story of how little Bruce Starzenski one day, more than a year ago, unknowingly brought about this series of broadcasts. On October 31, 1934, I broadcasted the recipe for making an exceedingly delicious orange cream layer cake. Before giving the recipe I emphasized the fact that anyone could make this cake with complete and outstanding success. I said: 'Anyone . . . . Anyone . . . . man, woman or child . . . . yes, any child of 10 years of age can make this delicious cake with absolute success.' Then I read a letter from a lady in Attleboro, Massachusetts . . . . one of tens of thousands of letters like it that I have received. In the letter Mrs. E. M. said in part: (Quote) Last December 31st was my birthday and my daughter, as a treat to me, made a birthday cake. She chose a layer cake with caramel filling and frosting. This was a cake I had never attempted, so she had not seen it made before . . . . neither the filling nor the frosting. I did not deter her, though having considerable misgiving about the result. The result was a triumph, so much so that when a friend came to take us away for supper, we took the cake along and all at the party were loud in their praise of it. I think they had a sneaking suspicion that I had helped her to make it, but I did nothing at all. She just took your book and followed the directions and the result was perfect. My daughter is 9 years old . . . . yes, nine . . . . not nineteen . . . . so you see your recipes are so easy that even a child can follow them. I am truly sorry for all the people who do not have your book. And the letter is signed Mrs. (I'll only give the initials) Mrs. E. M.

10-Year-Old Cook

"Now, this little boy was home that morning . . . . he had been ill and was being kept home from school that winter. He heard that broadcast in which I had also told how nearly all of the world's greatest men have and do today make cooking one of their hobbies. If he had listened without acting, this series of broadcasts would not have started, and you would not be listening to my Christmas message this morning. But this little boy not only listened . . . . he acted upon my advice. He took down the recipe . . . . he believed that what I said was so, 'that any child of 10 could make the cake with complete success.' He was 10 years old at that time. He not only wrote down the recipe but he went into the kitchen and without any previous knowledge of cooking he made a perfectly delicious cake. Then he wrote in for the book I was giving away at that time . . . . it arrived and then this little boy made various kinds of cakes and made delicious pies with perfect pastry . . . . and by the way now he is going ahead to prepare an entire dinner . . . . and who knows but what he may some day carry on the work I am doing now.

"Well, let me finish my story. This little boy's father is an officer of a well-known gas company. I met him and he told me the story of his son. That conversation led to

others with officials of gas companies, until on December 4, 1935, one year and one month later, this series of broadcasts started. All directly traceable to the fact that little Bruce Starzenski not only listened, but acted upon what he heard."

Electrical transcriptions of The Mystery Chef radio program are available to companies outside the present broadcasting area. Cost of a transcription ranges from $15 a broadcast for companies with 30,000 domestic meters or less to $75 a broadcast for companies with one million domestic meters in service. Several companies within a closely defined area may combine meters in the purchase of transcriptions. Full information may be secured from Regional Advertisers, Inc., Room 550, 420 Lexington Ave., New York.

Typical Observations from The Mystery Chef's Program

"Always be an artist at the gas range and cooking will always be a real pleasure to you and a source of real happiness to your family and friends."

"Love is far greater and more important than vitamins. Put love into your cooking and with loving hands prepare each meal."

"You will find enjoyment and thrills in the preparation of meals that cannot be exceeded by any other of the great arts."

"Happiness does not come from material things, but of all material things, nothing adds more to the happiness of your home than excellent cooking."

"When you cook a meal and see your family enjoy it and hear them say 'Mm! Mm! Everything is delicious' do you think that is all there is to it? The meal has gone. . . . . Yes. But the great silent force behind that meal remains. The real significance of home cooking is the silent unseen thing. It is the building of sacred memories around your dining room table—memories, that in years to come, will make your children talk of those wonderful pies and biscuits that mother used to bake . . . . those wonderful meals that mother used to cook. Do you think they will ever talk about those pies and biscuits that mother used to buy, or exclaim 'How wonderful were those cans that mother used to open!' *Now* is your opportunity to build those sacred memories. Make up your mind now to be an artist at the gas range and not just someone who cooks food."

"Few people use their kitchen more than I do; few people entertain more guests for dinner than we do in our home. I talk from practical experience. My home is a penthouse in New York City. The owners of the building have just finished rebuilding almost the whole house, except my penthouse which is built on top of the building and differs entirely from the rest of the house. They have put the latest of everything into the house and after seeing my kitchen, they equipped all the kitchens with the latest automatic gas ranges and gas refrigerators."

"We hear people talk about cooking by this or cooking by that as being modern, but from prehistoric days man has cooked by heat alone and it's only by heat that we can cook today, no matter how modern we may think we are. Of course, there have been vast improvements made in our modern equipment for cooking. These improvements help us tremendously in the art of excellent cooking and in many other home comforts. Call at your gas company's office and see the new modern gas equipment. You'll be delighted with it. If you want to excel in the art of cooking, my recommendation is that you use gas.

"When I recommend anything to you, I like to give you my reasons for doing so. When I recommend gas as the perfect fuel for cooking I'm ready to back my opinion with good sound common sense reasons."

"I have spent many months in preparing for this series of radio visits to your home. I haven't just signed a contract with your gas company to broadcast—no—I don't broadcast in that way. I consider your home as sacred as mine. I'm not going to come into your home by radio to tell you something just because I'm paid to do so. I believe I can help you in your daily duties, not only by giving you excellent recipes, but by arousing in you a desire to use to the full the vast possibilities of your life."

"Ah jest cain't find de stove, Miss Smiff!" J. EASLEY

Reprinted by special permission from "Collier's," December 7

How To Apply the Data in Gas Measurement Report No. 2

By S. R. BEITLER

Asst. Prof. of Mechanical Engineering, The Ohio State University, Columbus, Ohio

J. E. OVERBECK

Gas Measurement Engineer, Columbus, Ohio

Many requests have been received for suggestions as to the best procedure to be followed in the application of Report No. 2 of the Gas Measurement Committee. This paper describes a method of putting into practice the principles disclosed in the report. It explains one method which has been developed by Messrs. Beitler and Overbeck, who as members of the committee were active in the compilation of the report. It is expected to be a valuable addition to the literature for the guidance of the industry.

AT the time of the introduction of any new data, such as contained in the American Gas Association Gas Measurement Committee Report No. 2, it is probable that there will be considerable confusion by the users concerning the application of these data. This confusion will exist until the method of application of the data has been reduced to standard practice. Since the writers have assisted in the development of the data contained in the Gas Measurement Committee's report and in the preparation of the tables of constants and factors contained in that report, it was felt that they might be able to make some suggestions as to the use of such constants and factors, which might be of some value.

A study of the Gas Measurement Report No. 2 will show that the same general equation for calculating the flow of gas is used in that report as has always been used. This equation is the familiar $Q = C'\sqrt{h_w P_f}$, where Q is the quantity, C′ the flow constant or coefficient, h_w the differential pressure, and P_f the static pressure. However, a new method of determining C′ is given which takes into account some factors which were not previously considered in arriving at the coefficient. These new constants apply only to orifice meter stations designed and constructed according to specifications set up in this report. If the constants are used correctly, with properly constructed meter settings it will be possible to get a higher degree of accuracy over a much wider range of conditions than was possible with old coefficients.

This statement does not mean that quantities calculated using the old methods are necessarily incorrect. The old coefficients were determined using certain average conditions of pressure and differential with certain physical characteristics of the orifice station, and gave acceptable accuracy when used for measuring gas at approximately those conditions. For other conditions of pressure and flow, and for other pipe sizes and physical conditions at the orifice station, the quantity calculated might be inaccurate to a greater or lesser degree, depending upon the amount of divergence from the conditions used in determining the coefficients.

There may be some instances where an attempt will be made to compare the new constants with the old coefficients used prior to the publication of Report No. 2. No accurate comparison is possible unless it is known that the conditions of measurement are the same as those used in the determination of the old coefficients, for the new constants apply only to orifice stations constructed to specifications which correspond to the stations used in determining the constants, and factors are given to adjust for deviation of measurement conditions from calibration conditions.

In computing gas measurement deliveries through orifice meters, using the method outlined in Report No. 2, the constant C′ may be calculated to suit local conditions by using the proper factors for base pressure, base temperature, flowing temperature, specific gravity, expansion, Reynolds number and supercompressibility. Measurement computations have always taken account of all of these conditions except the last three. The factor for supercompressibility has been recognized and its use was recommended in Report No. 1 of the Gas Measurement Committee, the Report No. 2 giving only additional suggestions as to a method for its use. The only entirely new conditions to be considered are those of expansion and Reynolds number. The factors for taking account of changes in these conditions are given in Report No. 2 and shown as an addition to the equation for determination of the coefficient or orifice flow constant.

Report No. 2 recommends that the expansion factor (Y) and the Reynolds number factor (F_r) be based upon the meter records in the case of an existing installation, or estimated from average pressure and differential conditions at which the meter will be expected to operate in the case of a new installation. The report adds a further note as follows:

> "In use it may be found that a group of meters in the same locality or operating under the same conditions, will have the same values of F_r and Y. If this is true, the flow constants in this group will be the same for all plates of the same size and ration."

Many large gas companies operate a great number of orifice meters of the same size under approximately similar conditions and to have different Y and F_r factors for each meter station for the same orifice size and ratio would be very complicated and would probably lead to much confu-

sion and possible inaccuracy. It was necessary for the committee to furnish the information in the manner in which it is supplied in Report No. 2 because of the wide range of conditions under which orifice meters are used for measuring gas. It is probable that the Y and F_r factors can best be applied, particularly where large numbers of meters are in use, by grouping the meters operating under similar conditions and basing the factors upon the average conditions for this group. After the average h/P and average /hP for any group have been determined, the Y and F_r factors can be determined and a flow constant calculated which can be used for this group, as was the coefficient in the past.

Using this suggested method of applying Y and F_r factors, the number of meter groupings would, of course, depend on the range of conditions existing in any one gas measurement department. For example, the conditions in some gas measurement departments may be such that all of the orifice meters may fall in one group, and in others there may be several groupings. Also, in some gas measurement departments, it may be advisable to have only one group using coefficients based on Y and F_r factors applicable to the greatest majority of orifice meters and then treat all meters having conditions outside the range of this group as special and using individual Y and F_r factors.

The range of conditions which may be included in any grouping of meters will, of course, depend on the tolerance of accuracy set for any individual meter. In considering this tolerance, thought must be given to the fact that generally on any orifice meter the h/P (Y factor) and $\sqrt{hP}$ (F_r factor) are varying continuously, and that average conditions must be used which would ordinarily be compensating, as stated in the A. G. A. report. The tolerance of accuracy then existing on any meter station would be the difference in factors used in developing the coefficient applicable to a group of meters and those coefficients applicable to individual meter stations.

The range of conditions under a grouping of orifice meters using the same coefficients will also depend to a great extent, if the tolerance of accuracy is to be held at a minimum, on the type of connection used (flange or pipe taps) and on the location where the static pressure is taken.

Since the h/P ratio and the $\sqrt{hP}$ are varying continuously and the effect of these variables may tend to compensate for each other, it is desirable that the combined factor for Y and F_r should be considered.

Examples follow, showing a suggested method of grouping orifice meters and the application of Y and F_r factors.

Examples

The following paragraphs give some examples of typical conditions encountered by gas measurement operating departments; and some suggested methods of coefficient application. The examples apply to orifice meters using flange taps; however, the same general principle will apply to orifice meters using pipe taps.

Company A has, say, 500 orifice meters operating under various conditions. The size of pipe runs used are 2", 4", 6", 8", 10", and 12". The ranges of the differential gauges used are 20" and 100". The static gauge pressures are from practically zero up to 500 lbs. The lower range differential gauges are, of course, used on the lower static pressures. Flange taps are used on all meters.

(1) Assume that a study of conditions was made of the above noted 500 measuring stations as to h/P and $\sqrt{hP}$ conditions from which the Y factors and F_r factors are selected, and which are the only new factors included in the A. G. A. Gas Measurement Committee Report No. 2, which are different from those which have been in general use.

(2) Assume, for example, that the following was found to exist, and that the orifice meters were grouped as follows:

Group	*Number of Meters*	*Range of Static Gauges*	*Range of Differential Gauges*
A	225	Above 100 lbs.	100"
B	200	Above 25 lbs. to and including 100 lbs.	100"
C	75	Above 0 to and including 25 lbs.	20"

(3) From a study of these groups the following average conditions were found to exist:

Group	*Average h/P Ratio*	*Average* $\sqrt{hp}$
A	0.20	70
B	0.45	30
C	0.60	15

NOTE: In some instances different ranges of differential gauges may be used than indicated in examples, which may change the conditions indicated in the preceding table considerably.

NOTE: An item which must be considered in a study of metering conditions is that when the readings recorded on the charts are such that they do not give the most accurate measurement, taking into account local operating problems, such readings should not be included, but rather the range of the gauge or the size of the orifice plate should be changed. This may change some meters from one meter grouping to another.

(4) A further study has been made of the meters in each group as to the range of average h/P ratio and average $\sqrt{hP}$ for the individual meters, and the following conditions were found to exist:

Group No.	*Range of h/P Conditions*	*Range of* $\sqrt{hP}$ *Conditions*
A	0.02 to 0.85	30 to 200
B	0.05 to 2.50	8 to 80
C	0.05 to 1.00	5 to 20

NOTE: Based on the above conditions, it will be found from a study of the Y factors contained in the A. G. A. Report No. 2, that for Group B meters, intermediate static pressure connections can be used to better advantage due to the wide range of h/P conditions.

(5) Continuing the example, Y, F_r and combined Y and F_r factors were selected for some typical orifice sizes, and for the average conditions indicated in (3), these factors would be as follows:

GROUP A

Orifice Size	Y_2 *Factors*	F_r *Factors*	*Combined* Y_2 *and* F_r *Factors*
½ × 4	1.0013	1.0011	1.0024
1 × 4	1.0013	1.0006	1.0019
2 × 4	1.0012	1.0006	1.0018

GROUP B

Orifice Size	Y_m *Factors*	F_r *Factors*	*Combined* Y_m *and* F_r *Factors*
½ × 4	.9990	1.0026	1.0016
1 × 4	.9990	1.0015	1.0003
2 × 4	.9986	1.0013	.9999

GROUP C

Orifice Size	Y_2 *Factors*	F_r *Factors*	*Combined* Y_2 *and* F_r *Factors*
½ × 4	1.0040	1.0052	1.0092
1 × 4	1.0040	1.0029	1.0069
2 × 4	1.0036	1.0026	1.0062

(6) As explained in a previous paragraph, the accuracy for any individual orifice meter using factors based on group averages, would depend on the difference in Y and F_r factors developed for use with a group of meters and those developed for an individual meter, using actual existing conditions.

(7) Following are a few examples of some typical conditions which may exist on individual orifice meters during a 24-hour period, together with Y, F_r and combined Y and F_r factors to suit these conditions.

GROUP A—½" x 4" ORIFICE

Time	h	P (Gauge)	h/P	$\sqrt{hP}$	Y_2 Factors	F_r Factors	Combined Y_2 and F_r Factors
1:00 A.M.	10	304	.03	56.42	1.0002	1.0014	1.0016
2:00	10	304	.03	56.42	1.0002	1.0014	1.0016
3:00	10	304	.03	56.42	1.0002	1.0014	1.0016
4:00	9.5	304	.03	55.00	1.0002	1.0014	1.0016
5:00	10.5	304	.03	57.82	1.0002	1.0014	1.0016
6:00	9.5	304	.03	55.00	1.0002	1.0014	1.0016
7:00	10	304	.03	56.42	1.0002	1.0014	1.0016
8:00	12	304	.04	61.81	1.0003	1.0013	1.0016
9:00	12	304	.04	61.81	1.0003	1.0013	1.0016
10:00	13	300	.04	63.93	1.0003	1.0012	1.0015
11:00	14	300	.05	66.34	1.0004	1.0012	1.0016
12:00 N.	10	300	.03	56.07	1.0002	1.0014	1.0016
1:00 P.M.	9	300	.03	57.20	1.0002	1.0014	1.0016
2:00	10	300	.03	56.07	1.0002	1.0014	1.0016
3:00	8	300	.03	50.15	1.0002	1.0016	1.0018
4:00	13	300	.04	63.93	1.0003	1.0013	1.0016
5:00	14	296	.05	65.92	1.0004	1.0012	1.0016
6:00	13	296	.04	63.52	1.0003	1.0013	1.0016
7:00	10	296	.03	55.71	1.0002	1.0014	1.0016
8:00	7	296	.02	46.61	1.0001	1.0017	1.0018
9:00	7	296	.02	46.61	1.0001	1.0017	1.0018
10:00	10	296	.03	55.71	1.0002	1.0014	1.0016
11:00	8	296	.03	49.83	1.0002	1.0016	1.0018
12:00 M.	6	296	.02	43.16	1.0001	1.0018	1.0019
Average	10.2	300	.03	56.41	1.0002	1.0014	1.0016

Deviation from Group Averages = .08%

GROUP A—2" x 4" ORIFICE

Time	h	P (Gauge)	h/P	$\sqrt{hP}$	Y_2 Factors	F_r Factors	Combined Y_2 and F_r Factors
1:00 A.M.	64	232	.26	125.57	1.0016	1.0004	1.0020
2:00	44	232	.18	104.12	1.0011	1.0004	1.0015
3:00	41	232	.17	100.51	1.0010	1.0004	1.0014
4:00	31	232	.13	87.40	1.0008	1.0005	1.0013
5:00	28	236	.11	83.73	1.0007	1.0005	1.0012
6:00	30	236	.12	86.67	1.0007	1.0005	1.0012
7:00	27	240	.11	82.88	1.0007	1.0006	1.0013
8:00	26	240	.10	81.33	1.0006	1.0006	1.0012
9:00	26	244	.10	81.97	1.0006	1.0006	1.0012
10:00	26	244	.10	81.97	1.0006	1.0006	1.0012
11:00	27	244	.10	83.53	1.0006	1.0006	1.0012
12:00 N.	29	244	.11	86.57	1.0007	1.0005	1.0012
1:00 P.M.	32	244	.12	90.94	1.0007	1.0004	1.0011
2:00	38	244	.15	99.09	1.0009	1.0004	1.0013
3:00	37	240	.15	97.02	1.0009	1.0004	1.0013
4:00	41	240	.16	102.13	1.0010	1.0004	1.0014
5:00	44	236	.18	104.97	1.0011	1.0004	1.0015
6:00	38	232	.15	96.76	1.0009	1.0004	1.0013
7:00	80	232	.32	140.40	1.0019	1.0003	1.0022
8:00	43	232	.17	102.94	1.0010	1.0004	1.0014
9:00	38	236	.15	97.55	1.0009	1.0004	1.0013
10:00	23	240	.09	76.50	1.0005	1.0006	1.0011
11:00	20	240	.08	71.33	1.0005	1.0006	1.0011
12:00 M.	21	240	.08	73.09	1.0005	1.0006	1.0011
Average	35.6	238	.14	93.29	1.0009	1.0005	1.0013

Deviation from Group Average = .05%

GROUP A—1" x 4" ORIFICE

Time	h	P (Gauge)	h/P	$\sqrt{hP}$	Y_2 Factors	F_r Factors	Combined Y_2 and F_r Factors
1:00 A.M.	15	65	.19	34.51	1.0012	1.0013	1.0025
2:00	15	65	.19	34.51	1.0012	1.0013	1.0025
3:00	16	65	.20	35.64	1.0013	1.0013	1.0026
4:00	17	60	.23	35.56	1.0015	1.0013	1.0028
5:00	30	60	.40	47.24	1.0027	1.0010	1.0037
6:00	40	57.5	.56	53.63	1.0038	1.0008	1.0046
7:00	20	60	.27	38.57	1.0018	1.0012	1.0030
8:00	22	60	.30	40.46	1.0020	1.0011	1.0031
9:00	26	60	.35	43.98	1.0024	1.0010	1.0034
10:00	30	57.5	.42	46.44	1.0028	1.0010	1.0038
11:00	63	52.5	.94	64.92	1.0062	1.0007	1.0069
12:00 N.	45	52.5	.67	54.87	1.0045	1.0008	1.0053
1:00 P.M.	40	52.5	.60	51.73	1.0040	1.0009	1.0049
2:00	39	52.5	.58	51.08	1.0039	1.0009	1.0048
3:00	36	52.5	.54	49.07	1.0036	1.0009	1.0045
4:00	40	52.5	.60	51.73	1.0040	1.0009	1.0049
5:00	38	52.5	.57	50.42	1.0038	1.0009	1.0047
6:00	27	52.5	.40	42.50	1.0027	1.0010	1.0037
7:00	24	57.5	.36	41.54	1.0024	1.0011	1.0035
8:00	4	62.5	.06	17.54	1.0004	1.0025	1.0029
9:00	5	65	.06	19.92	1.0004	1.0022	1.0026
10:00	6	65	.08	21.83	1.0006	1.0021	1.0027
11:00	4	67	.05	18.04	1.0004	1.0025	1.0029
12:00 M.	3	70	.04	15.91	1.0003	1.0028	1.0031
Average	25.2	59	.36	40.07	1.0024	1.0013	1.0037

Deviation from Group Averages = .18%

GROUP B—½" x 4" ORIFICE

Time	h	P (Gauge)	h/P	$\sqrt{hP}$	Y_m Factors	F_r Factors	Combined Y_m and F_r Factors
1:00 A.M.	19	16	.62	24.03	.9986	1.0032	1.0018
2:00	20	15.5	.67	24.45	.9985	1.0032	1.0017
3:00	19	15.5	.64	23.84	.9985	1.0032	1.0017
4:00	21	15.5	.70	25.06	.9984	1.0031	1.0015
5:00	27	14.5	.93	27.94	.9978	1.0028	1.0006
6:00	36	13.5	1.29	31.69	.9971	1.0025	.9996
7:00	37	11	1.46	30.66	.9967	1.0026	.9993
8:00	39	8.5	1.70	29.89	.9962	1.0026	.9988
9:00	38	8	1.70	29.17	.9962	1.0027	.9989
10:00	41	9	1.75	30.97	.9960	1.0025	.9985
11:00	38	8.5	1.66	29.50	.9963	1.0026	.9989
12:00 N.	31	10.5	1.25	27.78	.9972	1.0028	1.0000
1:00 P.M.	29	12	1.10	27.67	.9975	1.0028	1.0003
2:00	29	12.5	1.08	27.93	.9975	1.0028	1.0003
3:00	28	13	1.02	27.70	.9977	1.0028	1.0005
4:00	30	12.5	1.12	28.41	.9975	1.0028	1.0003
5:00	31	11	1.22	28.06	.9975	1.0028	1.0001
6:00	25	12	.94	25.69	.9978	1.0030	1.0008
7:00	25	14	.88	26.65	.9979	1.0029	1.0008
8:00	24	14	.84	26.11	.9980	1.0030	1.0010
9:00	23	14.5	.80	25.78	.9981	1.0030	1.0011
10:00	22	15	.75	25.43	.9982	1.0031	1.0013
11:00	22	15.5	.74	25.65	.9982	1.0031	1.0013
12:00 M.	24	15.5	.80	26.79	.9981	1.0029	1.0010
Average	28.2	12.6	1.07	27.37	.9975	1.0029	1.0004

Deviation from Group Average = .12%

GROUP B—1″ x 4″ ORIFICE

Time	h	P (Gauge)	h/P	$\sqrt{hP}$	Y_m Factors	F_r Factors	Combined Y_m and F_r Factors
1:00 A.M.	8	19	.24	16.35	.9994	1.0027	1.0021
2:00	8	19	.24	16.35	.9994	1.0027	1.0021
3:00	8	19	.24	16.35	.9994	1.0027	1.0021
4:00	10	19	.30	18.28	.9993	1.0024	1.0017
5:00	15	19	.45	22.38	.9990	1.0020	1.0010
6:00	40	18.5	1.22	36.28	.9972	1.0012	.9984
7:00	80	18	2.47	50.91	.9945	1.0009	.9954
8:00	82	16	2.71	49.93	.9941	1.0009	.9950
9:00	56	16	1.85	41.63	.9958	1.0011	.9969
10:00	50	17	1.60	39.62	.9964	1.0011	.9975
11:00	70	17	2.24	46.88	.9950	1.0010	.9960
12:00 N.	23	16	.76	26.44	.9982	1.0017	.9999
1:00 P.M.	23	18	.71	27.30	.9984	1.0017	1.0001
2:00	20	18.5	.61	25.66	.9986	1.0018	1.0004
3:00	20	18.5	.61	25.66	.9986	1.0018	1.0004
4:00	24	18	.74	27.89	.9983	1.0017	1.0000
5:00	40	17	1.28	35.44	.9971	1.0013	.9984
6:00	30	17.5	.94	30.93	.9978	1.0015	.9993
7:00	20	18.5	.61	25.66	.9986	1.0018	1.0004
8:00	20	18.5	.61	25.66	.9986	1.0018	1.0004
9:00	16	18.5	.49	22.95	.9988	1.0021	1.0009
10:00	10	18.5	.31	18.14	.9993	1.0024	1.0017
11:00	8	19	.24	16.35	.9994	1.0027	1.0021
12:00 M.	6	19	.18	14.16	.9995	1.0031	1.0026
Average	28.63	18	.90	28.22	.9979	1.0018	.9998

Deviation from Group Average = .05%

GROUP B—2″ x 4″ ORIFICE

Time	h	P (Gauge)	h/P	$\sqrt{hP}$	Y_m Factors	F_r Factors	Combined Y_m and F_r Factors
1:00 A.M.	7	38	.13	19.15	.9996	1.0021	1.0017
2:00	6	38	.11	17.73	.9997	1.0023	1.0020
3:00	5	38	.09	16.19	.9997	1.0024	1.0021
4:00	5	38	.09	16.19	.9997	1.0024	1.0021
5:00	5	37	.10	16.03	.9997	1.0025	1.0022
6:00	5	36	.10	15.88	.9997	1.0025	1.0022
7:00	7	32	.15	18.02	.9996	1.0022	1.0018
8:00	12	34	.25	24.10	.9992	1.0017	1.0009
9:00	48	32	1.03	47.19	.9970	1.0009	.9979
10:00	55	34	1.14	51.60	.9967	1.0008	.9975
11:00	50	32	1.08	48.17	.9969	1.0008	.9977
12:00 N.	80	30	1.80	59.60	.9948	1.0007	.9955
1:00 P.M.	60	35	1.21	54.44	.9966	1.0008	.9974
2:00	24	37	.47	35.12	.9986	1.0011	.9997
3:00	14	38	.27	27.08	.9992	1.0014	1.0006
4:00	8	38	.15	20.47	.9996	1.0020	1.0016
5:00	7	37	.14	18.97	.9996	1.0021	1.0017
6:00	6	36	.12	17.39	.9997	1.0023	1.0020
7:00	14	38	.27	27.08	.9992	1.0015	1.0007
8:00	9	38	.17	21.71	.9995	1.0019	1.0014
9:00	7	37	.14	18.97	.9996	1.0021	1.0017
10:00	8	38	.15	20.47	.9996	1.0020	1.0016
11:00	8	38	.15	20.47	.9996	1.0020	1.0016
12:00 M.	8	38	.15	20.47	.9996	1.0020	1.0016
Average	19.1	36.1	.39	27.19	.9989	1.0018	1.0006

Deviation from Group Average = .07%

GROUP C—½″ x 4″ ORIFICE

Time	h	P (Gauge)	h/P	$\sqrt{hP}$	Y_a Factors	F_r Factors	Combined Y_a and F_r Factors
1:00 A.M.	4	.5	.27	7.72	1.0018	1.0101	1.0119
2:00	5.5	.5	.37	9.05	1.0025	1.0087	1.0112
3:00	6	.5	.40	9.45	1.0027	1.0083	1.0110
4:00	6.5	.5	.44	9.84	1.0029	1.0080	1.0109
5:00	7	.5	.47	10.21	1.0031	1.0077	1.0108
6:00	7	.5	.47	10.21	1.0031	1.0077	1.0108
7:00	6.5	.5	.44	9.84	1.0029	1.0080	1.0109
8:00	6	.5	.40	9.45	1.0027	1.0083	1.0110
9:00	5	.5	.34	8.63	1.0023	1.0091	1.0114
10:00	3	.5	.20	6.68	1.0013	1.0117	1.0130
11:00	1	.5	.07	3.86	1.0005	1.0195	1.0200
12:00 N.	3	.5	.20	6.68	1.0013	1.0117	1.0130
1:00 P.M.	5	.5	.34	8.63	1.0023	1.0091	1.0114
2:00	7	.5	.47	10.21	1.0031	1.0077	1.0108
3:00	9	.5	.60	11.58	1.0040	1.0068	1.0108
4:00	11	.5	.74	12.80	1.0049	1.0061	1.0110
5:00	13	.5	.87	13.92	1.0058	1.0057	1.0115
6:00	17	.5	1.14	15.92	1.0076	1.0049	1.0125
7:00	18	.5	1.21	16.38	1.0081	1.0048	1.0129
8:00	15	.5	1.01	14.95	1.0068	1.0052	1.0120
9:00	12	.5	.81	13.37	1.0053	1.0058	1.0111
10:00	8	.5	.54	10.92	1.0036	1.0072	1.0108
11:00	7	.5	.47	10.21	1.0031	1.0077	1.0108
12:00 M.	5	.5	.34	8.63	1.0023	1.0117	1.0140
Average	7.8	.5	.53	10.38	1.0036	1.0084	1.0118

Deviation from Group Average = .26%

GROUP C—1″ x 4″ ORIFICE

Time	h	P (Gauge)	h/P	$\sqrt{hP}$	Y_a Factors	F_r Factors	Combined Y_a and F_r Factors
1:00 A.M.	12	5	.62	15.26	1.0041	1.0029	1.0070
2:00	12	5	.62	15.26	1.0041	1.0029	1.0070
3:00	12	5	.62	15.26	1.0041	1.0029	1.0070
4:00	11.5	5	.59	14.94	1.0039	1.0029	1.0068
5:00	11.5	5	.59	14.94	1.0039	1.0029	1.0068
6:00	11.5	5	.59	14.94	1.0039	1.0029	1.0068
7:00	11	5	.57	14.61	1.0038	1.0030	1.0068
8:00	11	5	.57	14.61	1.0038	1.0030	1.0068
9:00	10.5	5	.54	14.27	1.0036	1.0031	1.0067
10:00	10.5	5	.54	14.27	1.0036	1.0031	1.0067
11:00	10	5	.52	13.93	1.0034	1.0032	1.0066
12:00 N.	9	5	.46	13.21	1.0030	1.0033	1.0063
1:00 P.M.	9	5	.46	13.21	1.0030	1.0033	1.0063
2:00	9	5	.46	13.21	1.0030	1.0033	1.0063
3:00	10	5	.52	13.93	1.0034	1.0032	1.0066
4:00	10	5	.52	13.93	1.0034	1.0032	1.0066
5:00	11	5	.57	14.61	1.0037	1.0030	1.0067
6:00	11	5	.57	14.61	1.0037	1.0030	1.0067
7:00	11.5	5	.59	14.94	1.0039	1.0029	1.0068
8:00	12	5	.62	15.26	1.0041	1.0029	1.0070
9:00	12	5	.62	15.26	1.0041	1.0029	1.0070
10:00	12	5	.62	15.26	1.0041	1.0029	1.0070
11:00	12	5	.62	15.26	1.0041	1.0029	1.0070
12:00 M.	12	5	.62	15.26	1.0041	1.0029	1.0070
Average	10.9	5	.57	14.59	1.0037	1.0030	1.0068

Deviation from Group Average = .01%

GROUP C—2" x 4" ORIFICE

Time	h	P (Gauge)	h/P	$\sqrt{hP}$	Y_2 Factors	F_r Factors	Combined Y_2 and F_r Factors
1:00 A.M.	2	17	.06	7.92	1.0004	1.0050	1.0054
2:00	2	17	.06	7.92	1.0004	1.0050	1.0054
3:00	2	17	.06	7.92	1.0004	1.0050	1.0054
4:00	2	17	.06	7.92	1.0004	1.0050	1.0054
5:00	4	16	.13	11.03	1.0008	1.0036	1.0044
6:00	4	16	.13	11.03	1.0008	1.0036	1.0044
7:00	4	16	.13	11.03	1.0008	1.0036	1.0044
8:00	6	14	.21	13.05	1.0013	1.0031	1.0044
9:00	12	13	.44	18.13	1.0027	1.0022	1.0049
10:00	14	13	.51	19.58	1.0031	1.0020	1.0051
11:00	10	13	.36	16.55	1.0022	1.0024	1.0046
12:00 N.	4	15	.14	10.84	1.0008	1.0037	1.0045
1:00 P.M.	6	13	.22	12.82	1.0013	1.0031	1.0044
2:00	12	13	.44	18.13	1.0027	1.0022	1.0049
3:00	14	13	.51	19.58	1.0031	1.0020	1.0051
4:00	16	13	.58	20.94	1.0035	1.0019	1.0054
5:00	10	13	.36	16.55	1.0022	1.0024	1.0046
6:00	8	15	.27	15.34	1.0016	1.0026	1.0042
7:00	6	16	.20	13.51	1.0012	1.0030	1.0042
8:00	4	16	.13	11.03	1.0008	1.0036	1.0044
9:00	2	17	.06	7.92	1.0004	1.0050	1.0054
10:00	2	17	.06	7.92	1.0004	1.0050	1.0054
11:00	2	17	.06	7.92	1.0004	1.0050	1.0054
12:00 M.	2	17	.06	7.92	1.0004	1.0050	1.0054
Average	6.2	15.2	.22	12.60	1.0013	1.0035	1.0049

Deviation from Group Average = .13%

Discussion and Conclusions

A study of the foregoing typical examples shows that the maximum deviation of the combined Y and F_r factors from the factors for the assumed average for Groups A and B is less than ¼ of one per cent, and for Group C approximately ¼ of one per cent. Since the tolerance set up for orifice flow constant C′ in Gas Measurement Report No. 2 is ½ of one per cent, and the difference found by these examples is much less than that, it is very evident that this method would be within the limits of accuracy given for the orifice flow constant.

It should be noted for the examples chosen, Groups A and B could be combined without affecting the relative accuracy of measurement. However, this is true only if downstream static pressures are taken for Group A and intermediate static pressures for Group B. An entirely different series of constants, however, must be used for Group C.

It is evident that in many cases the location of static pressure connection can be changed and thus bring individual measuring stations within the tolerance of accuracy desired, without changing the orifice flow constant. For example, a certain measuring station may not be within the tolerance of accuracy desired when used with combined factors based on group averages by the use of downstream static pressure connections, but would be within such tolerance by the use of intermediate pressure connections.

Where the method of using combined factors is applied to a group of meters, a periodic study would be required for the individual meter stations in the same manner as indicated in the previous tables, in order to assure that the measurements are within the tolerance desired. This would mean that the correct range of gauge would always be used and the correct location for static pressure connection be maintained.

The foregoing tables also show the deviation of hourly combined F_r and Y factors from station factors. It will be noted that the meters in Group A show a very small deviation from the daily and group averages. The deviation for those in Group B is greater. However, the deviation for any hour is approximately ½ of one per cent, and the average compensates over a 24-hour period, while the maximum deviation of measurement is less than $^1/_{20}$ of one per cent.

It is felt that the conditions assumed in the examples represent a fair average of the conditions which may exist, and if a similar method is followed, the use of the tables in the A. G. A. Gas Measurement Committee Report No. 2 should be no more difficult than the use of the old tables, after the initial study is made. The values of combined factors for the above examples should not be used, but rather these factors should be based on an actual study of existing conditions.

When the values for the combined factors are once established for the existing conditions, the basic orifice factor should be multiplied by the determined combined Y and F_r factors for the particular orifice sizes in use. This resulting factor or constant can be used exactly as was the old basic coefficient. It will not be necessary to make any change in this constant unless the average operating conditions of a meter depart beyond the limits established for its particular group of meters.

D. D. Barnum Heads American Standards

D. D. Barnum

DANA D. BARNUM, president of the Boston Consolidated Gas Company and third president of the American Gas Association, has been elected president of the American Standards Association, the national clearing house for standards and safety codes. Mr. Barnum succeeds Howard Coonley, president of the Walworth Company, manufacturers of pipe and pipe fittings, as head of the association. Edmund A. Prentis, member of the civil engineering firm of Spencer, White and Prentis, Inc., New York, was named vice-president.

Mr. Barnum has served on the board of directors of the American Standards Association since 1933, when he was elected as a representative of the American Gas Association. A graduate of Stevens Institute in 1895, he began his career with the E. W. Bliss and Company, Brooklyn, N. Y., leaving there to join the Worcester Gas Light Company, which elected him president in 1915. He joined the Boston Consolidated in 1917 and was elected president in 1921. He served as president of the American Gas Asociation in 1921-1922.

J. C. Irwin was re-elected chairman of the A. S. A. Council and F. M. Farmer was re-elected vice-chairman. The former represents the Association of American Railroads and the latter, who is vice-president of the Electrical Testing Laboratories, New York, represents the American Society for Testing Materials.

Gas Stars in "The Heart of the Home"

Pictures taken from the talking film, "The Heart of the Home," produced by The Peoples Gas Light and Coke Company, Chicago, Illinois, to demonstrate the superiority of gas fuel for cooking and other purposes. The film has proved popular over a wide area and is in constant demand

The "Tea Kettle" Water Heating Service

By W. E. McCREERY

General Sales Manager,
Blackstone Valley Gas & Elec. Co.,
Pawtucket, R. I.

IN the territories served by the Blackstone Valley Gas and Electric Company, embracing the mill cities of Pawtucket and Woonsocket, Rhode Island, we serve a total of 32,000 domestic gas customers. Of this total 20,000, or 63%, are still using the old, traditional tea kettle for the heating of water. They are forced to continue this old method because of two general reasons; first, these 20,000 homes have only a cold water line available; and second, their low income does not permit the use of convenient hot water service.

This condition has constituted a real problem to our company in the effort over the years to expand and develop our water heating business. We have tried all the known selling tricks, including the offer of free hot water piping with the sale of heaters, rental plans, guaranteed gas bills, etc. But we have failed to make any noticeable gain in arousing their interest. True, most of these people use gas for cooking but the operating cost and investment for additional uses were apparently unsurmountable barriers to overcome.

Small Investment

In the fall of 1934 we took another hitch in our belts and decided to give this problem real study. The elements of appeal considered necessary to educate these people to gas water heating service were; first, small investment; second, low operating cost; and third, convenience.

At about this time we attended a meeting in our Boston office and listened to one of our executives describe his recent trip abroad. In this talk he mentioned the "Spot the Job" type of heater, used extensively in several European countries. These heaters employed the instantaneous principle, and were designed to plug in to the existing cold water line.

Here was an idea that had the features we were interested in. Within two weeks we presented our ideas of such a heater to a prominent manufacturer who agreed to build them for us. This heater is of the continuous flow type, has a demand of sixty cubic feet of gas per hour, and delivers about one-half gallon of hot water per minute. It has a pilot and is

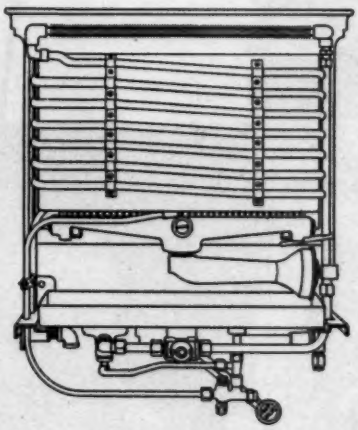


Diagram showing construction of junior water heater

manual in operation. The flow of water is slightly larger than the stream from an ordinary tea kettle.

The first samples received were subjected to laboratory tests and installed in employee homes for observation. Our tests proved that the idea was sound, safe, and practical. Our next step was to prepare selling policies and terms. Bearing in mind the low investment necessary, we established the following schedule: the heater to be rented at a rental fee of 25 cents per month for the first year. At the end of this period customers would have the option of buying the heater outright at terms as low as $1.00 per month, or to continue rental at the rate of 50 cents per month.

In order to capitalize on the peak water heater season we made public announcement of this service in May 1935, approximately one month before production stock began to arrive in our storeroom. Customer response was immediate and in such volume that we were not up with installations until about July 15. Results to date, covering a period of slightly over six months, have exceeded our expectations. Our experience definitely proved that the so-called low use, or "tea kettle customer" wants the convenience of automatic service. This faucet heater idea appeals to them and fits their pocketbooks.

For the six months' period of this activity we have installed a net total of 800 heaters. We have conducted two special campaigns, one at the start of this activity and one in September of this year. Due to the large number of present users, over-the-counter-sales alone in our various offices average from ten to fifteen orders per week.

Service Praised

I could tell you many interesting stories about the use of these heaters in these homes. How these families are praising this service; how a few have stated that their past fears of little Mary and Johnny overturning the tea kettle, or other crude vessels, have now been eliminated; of the demand by all members of the family for this water at the kitchen sink; of the visiting nurse who said the service was a boon to the people during times of illness and disease. However, for the sake of brevity I will merely present high-lights of our experience to date.

1. Since this activity started, twenty installations have been converted to a larger service, using standard heaters.

2. To date as far as we know, we have not received a single high bill complaint. Won't you agree that this is a significant statement?

3. The educational factor is working. We are receiving many requests for a second or third heater in other parts of the house. We are not meeting this request, however, because regulations confine this service to the kitchen only, and also because of our desire to limit this service.

4. A number of installations have been made in the homes of automatic users who, because of lower income, had been forced to discontinue automatic service.

Presented at Sales Division meeting of the New England Gas Association, November 8, 1935.

One of the earlier water heater installations in a typical setting. The heater is hand made, lacking the finishing touches of the production model

5. As proof of the fact that this service is actually going into the homes of the low-use customer, the great majority of installations to date have been made in poorly rated districts.

6. This new plan has revolutionized the water heater interest of our sales people. They have a brand new story to tell and a new territory to work.

7. During the period of this activity sales of regular heaters have increased 20%.

8. One-third of the installations to date have been made by local plumbers, representing a substantial contribution to their business.

9. A recent survey of 100 users revealed that the increment, or increased use, after allowing for the replacement factor of the tea kettle, is from 300 to 400 cubic feet per month average.

10. We have evidence to show that some portion of our present gain in gas meters over the previous year is due to the installation of this small heater.

Summarizing, let me again make it clear that because of our limited experience we cannot make positive or final statements. We are impressed, however, with the very satisfactory performance of this service to date. There is no doubt in our minds that considerable educational work has been accomplished during this short period of six months.

To us, these 800 installations now in service, and with prospects good for 1000 by January 1, represent the best "calling card" for appointments with these customers next year that we have ever used. In our opinion we have turned a dead market into a live one. We can also make good use of the 3,000,000 cubic feet added to our lines by this activity in 1935.

Our program next year calls for a continuation of this project. However, the amount of sales pressure to be applied in extending this service will largely depend upon the conversion value of the installations made during the current year. If our future progress continues in line with our experiences to date we expect to give every tea kettle in our territory a college education.

Gas Range Manufacturers Study A. G. A. Research Data

AT the invitation of the Committee on Domestic Gas Appliance Research, F. J. Rutledge, chairman, a sizeable number of gas appliance manufacturers in the United States and Canada have recently dispatched technical representatives to the American Gas Association Testing Laboratories in either Cleveland, Ohio, or Los Angeles, California, to examine and discuss the research results secured during the initial three months' period of technical investigation dedicated to improving gas range performance by combinations of moderate constructional modifications. Other producers have made appointments for similar sessions in the near future. All range manufacturing members of the American Gas Association were apprised of the existence and availability of data late in October and were offered the opportunity to visit the Laboratories for conference thereon.

Investigational work was begun at the Cleveland Testing Laboratory June 15, 1935. During this research minor alterations were made in many constructional points on numerous typical present-day models of ranges. Oven, broiler, and top burner efficiency, convenience, and speed of operation were studied both with the appliances as received and as revamped in numerous ways. A review of the aggregate improvement effected in all cases demonstrated that worth-while improvements are possible through combinations of numerous minor changes in construction.

During the study top burner venting heights, top burner and oven secondary air provisions, oven burner port locations, flue product travel through ovens, broiler burner input rates, top grate-to-frame contacts, and other features of range design, were widely varied. The tests disclosed many interesting possibilities and pointed the way for future study sponsored by the Domestic Gas Appliance Research Committee.

Several of the manufacturers visiting the Association's Laboratories for information indicated their belief that certain improvements of the nature suggested could be incorporated with benefit in their products and would be considered seriously in connection with the design of shortly forthcoming models. It is, of course, understood that much of the data collected to date in the course of the investigation is preliminary and not final.

Interest in the problem has been very encouraging and the industry in general seems well satisfied with the turn the study has taken. Such engineering representatives of member gas utilities as wish it, are also welcome to confer at the Laboratories on the problem in the same manner that the manufacturers have.

At present, Testing Laboratories' engineers assigned to the project are studying the influence upon gas range performance characteristics of design changes of a more major nature. Such matters as the effects of methods and thickness of oven insulation, top burner capacities and broiler load temperatures are being studied.

Wanted, A Hero

The general session of the American Gas Association convention at Atlantic City next October will pause in its consideration of the problems of the gas industry to honor a hero.

The attention of that large audience will be focused on an employee of some gas company. He may be a humble man in a menial position facing, for the first time, a sea of sympathetic eyes. That man will receive, from the hands of President Denning, the American Gas Association Meritorious Service Medal for having performed the most meritorious deed within the gas industry during the year ending June 30, next. The deed may have been the saving of human life or property. At some time, that man faced an emergency, used his head, and acted wisely.

The man thus honored may be a fellow employee of your company. If you know of one you think would be eligible for this distinction, write to the Association for an application blank. You may be the means of honoring a hero.

Association's Work Commended in Company's Annual Report

Arthur Hewitt

AT the eighty-seventh annual meeting of the stockholders of The Consumers' Gas Company of Toronto, November 18, 1935, President Arthur Hewitt paid an unusual tribute to the work of the American Gas Association. His remarks have been published in the annual report of the company. This is believed to be the first instance of a reference to Association activities in a company's annual report to its stockholders.

In moving the adoption of the Annual Report of the Directors, President Hewitt said, in part:

For many years, the company has been selling to its customers, through its commercial department, approved and efficient gas-consuming appliances on convenient terms of payment. In this connection, it is distinctly encouraging to report that the number of automatic gas water heaters sold during the year 1935 was four-and-a-half times the number sold in 1934.

Of course, the selling of appliances constitutes only one phase of the Commercial Department's activities. It is the function of this department also to assist its customers in securing the best possible results from their appliances, and skilled men are available to any industrial establishment for consultation on any problems involving the application of heat.

The fuel value of gas is entirely dependent upon the efficacy of the appliance to render a satisfactory degree of service. The entire gas industry has taken very seriously its responsibility for providing gas-consuming appliances which are safe, durable and efficient. For this purpose, the American Gas Association established a Testing Laboratory at Cleveland in 1925, the chief functions of which were to develop and secure national acceptance of complete standards of construction and performance for all types of gas appliances and their accessories, and also to test, certify and annually inspect gas appliances and their accessories for compliance with the standards adopted.

For some years prior to the establishment of the Testing Laboratory it had become evident that both manufacturers and consumers of gas and gas appliances would be materially benefited if proper standards for gas appliances could be developed and enforced. Not only was it desirable to discontinue the use of appliances of inferior design, but it was equally necessary to determine and state exactly what constituted a serviceable piece of equipment and how a given appliance could be measured against such standards.

The testing of appliances for compliance with approval standards is a huge task, even in the modern laboratories equipped for this specific purpose. For example, a gas range must be subjected to and comply with more than two hundred and seventy-five tests before approval of its design and construction may be granted.

To give some idea of how universal has been the acceptance of the Laboratory's standards on the part of gas appliance manufactures, it is only necessary to state that ninety-three per cent of the gas appliances sold in the United States and Canada last year bore the Testing Laboratory's seal of approval.

During the past ten years, more than twenty-six thousand different models of gas appliances have been tested and certified as complying with the Laboratory's standards. These appliances represented practically every type of domestic gas appliance as well as many varieties of commercial and industrial apparatus.

In addition to the appliance testing work of the Laboratory, a programme of research into problems of gas production and distribution has been undertaken, also into problems of domestic and commercial gas utilization. In the field of industrial gas utilization, among the research projects which have been undertaken and successfully completed to date are the following: a study of the characteristics of burning gas with preheated air; research in the elimination of noise in industrial gas burners; research in the fundamentals of combustion space requirements in high temperature gas furnaces; and researches in the effect of operating temperature and furnace pressure on the combustion of industrial gas.

This great cooperative effort towards improvement in gas appliance design and construction has placed the gas industry definitely in a better position to meet the competition constantly being offered by other fuels. The research work will also stimulate advancement in every phase of the gas industry.

The results of this research and the advantages of the appliance testing work are made available to this company through its membership in the American Gas Association.

Gas for Catering

THE *Gas World* (London) November 9 comments on gas displacing electricity in the Harrowgate General Hospital for the catering equipment. The scales against gas were as heavily loaded as possible, since electricity was in possession with a municipal supply and at a low price.

A Word About Taxes

IT was David Harum who said that the fleas on a dog were good for him. They kept him from worrying over the fact that he was a dog. But we all know what happens to the dog who acquires too many fleas. He becomes thin and depressed. All of his energies are consumed in scratching, so that he has little time or inclination to function as a dog.

So with Taxes. A few no doubt are good for us. They make us realize we have a responsibility and part in the government of our country. But too many taxes, like the fleas, harass and sour our existence. They keep us everlastingly scratching to reduce them, and leave us with little enthusiasm or disposition to function as energetic and happy citizens.

Taxes have now reached menacing proportions. They now hit us from every angle. The taxes we pay as individuals, both directly and in all the goods we buy, reduce our purchasing power and by that much reduce our standards of living. The taxes which your Company must pay make it that much more difficult to do business, and so indirectly tend to curtail employment.

Each employee should therefore take an intelligent interest in the political affairs of his community, his State, and the Nation. Intelligent voting is now more of a necessity than ever. Only by electing to public office honest, experienced and responsible men can we hope for efficient and economical government.

It should be borne in mind that every penny which the national, or any local government body may propose to spend, must come from the pockets of the citizens. Spending on the part of political bodies has now reached the proportions of a menace to our future welfare. The ancient virtue of thrift still holds true for nations as well as individuals.

To effect a cure for present-day evils it should be the duty of everyone to see that only tried and experienced men are elected to public office. It is a good rule to vote for no man you would not consider hiring to run a business of your own. Public affairs are your business.

—*Massachusetts Gas Companies' Bulletin.*

Pittsburgh's Contribution to Safety in the Distribution of Natural Gas*

By JAMES B. GARNER, Ph.D.

Natural Gas Fellowship, Mellon Institute, Pittsburgh, Pa.

Dr. J. B. Garner

ON July 28, 1935, seven years had passed since the institution of the Utility Survey Commission of the Greater Pittsburgh District. The Commission has been in continuous daily activity during this period. The Commission is sponsored and supported by the four utility companies—The Duquesne Light Company, The Equitable Gas Company, The Manufacturers Light and Heat Company, and The Peoples Natural Gas Company.

Dr. Garner is originator of the safety plan outlined in this article and managing director of the activity since its inception seven years ago. Other members of the Commission's Executive Committee are E. W. Judy, George W. Ratcliffe and F. F. Schauer.

The methods and apparatus which are used in our gas leakage work have become more or less standardized and are therefore applicable, with slight modification, for gas leakage work generally. In *Natural Gas*, issue of February, 1929, a detailed discussion of methods, apparatus and procedure was given. As time has gone on, experience has not occasioned any essential or fundamental changes.

The work of the Commission may be generally described by the five following words:

(1)—Inspecting; (2)—Prospecting; (3)—Corrective; (4)—Reporting; and (5) Creative.

The results of the work have shown that there is ample justification for a comprehensive extension of the field of activity of the Commission. Its activities now concern and affect numerous phases of Public Utility management.

The *inspecting work* is done by two crews of well trained and thoroughly equipped men. One of these crews is charged with the inspection work in the City of Pittsburgh and the other is charged with the inspection work in the adjacent 93 boroughs. On the average the inspection groups have been able to cover the entire Pittsburgh Metropolitan District systematically and in an effective way in each period of 106 days. Each crew inspects daily about 400 street openings. Between July 28, 1928, and July 28, 1935, 612,604 street openings have been inspected and 33,065 faulty surface conditions accurately located and the percentage of gas in each location determined. The prime duty of the inspecting groups is to secure evidence *on the surface*, or *above the ground*, of gas leakage. Each inspecting group is equipped with an automobile, safety lamp, gas sample bottles, gas analysis apparatus and other necessities which the work requires. Each day's results are reported in writing. A drawing showing the kind of street opening and its exact location is prepared for each faulty or gaseous street opening. The drawings thus prepared serve as guides to the prospecting crews.

There are three kinds of equipment which are used by both the inspecting and prospecting crews. The first of these is the adapted Wolf Safety Lamp. The principle of the safety lamp rests on a discovery made by Sir Humphrey Davy in 1813 "that ignited gas, or flame, is extinguished by contact with a large surface of a good conductor of heat such as copper." This lamp has a round burner which receives its supply of air from below and is provided with an internal metal spark igniter. The fuel which is used is high test gasoline. The lamp is equipped with a two piece metal base, the lower half of which is provided with a half inch nipple approximately three inches long. This nipple enables the inspector to direct a sample of the gas under examination into the lamp. The sample of gas may come from a manhole, curb box, gate box or a barhole. An aspirator bulb is used in directing the supply of gas from any opening or crevice into the lamp. Should the lamp flame be extinguished the lower half of the base is removable thus allowing the inspector to relight the lamp in the usual fashion. The flame in the lamp is adjusted to about ½" in length. If the flame is not elongated or extinguished, the street opening is free of gas. The presence of natural gas between 0.75% and 3.5% causes a gradual elongation of flame from ½ to one inch. In an atmosphere containing more than 4% natural gas, the flame is extinguished, usually with a flash or "Swirl." The higher the percentage of gas the shorter the time required to extinguish the flame. The presence of 4% or more of carbon dioxide, no natural gas being present, will cause the flame to shorten and gradually be extinguished.

The gas sampling equipment consists of bottles, rubber hose, hand pump or aspirator and connecting tubes. All samples are collected by displacement of water, or in winter weather, salt solution.

Gas analysis is effected in the Flamex apparatus. This apparatus was invented and developed in the Hope Natural Gas Laboratory at the Mellon Institute. By means of this apparatus and in accordance with the tabulation of data—flame length and percentage of natural gas—the compo-

* Reprinted from *Natural Gas*.

sition of samples is determined as samples are collected. In the use of the Flamex gas analyzing apparatus the following tabulation of data is used:

Flame Length —Inches	*Per Cent Natural Present*
1/16	4
1/8	7
1/4	16
3/8	25
1/2	31
5/8	37
3/4	44
7/8	50
1	56
1 and 1/8	64
1 and 1/4	71
1 and 3/8	78
1 and 1/2	86
1 and 5/8	93
1 and 3/4	100

The flow of gas through the Flamex is regulated by displacement with water at the rate of 214 cubic centimeters per minute. The following is the approximate composition of the natural gas supply which was used in standardizing the Flamex:

Carbon dioxide	0.1
Propane and higher hydrocarbons	1.3
Methane	30.0
Ethane	18.6
Total	100.0
Specific gravity (air equals 1)	0.6604
Explosive limits	4.8 to 15

Gross heating value per cubic foot at 60° F. and 30" of mercury—1215 B.t.u.

It is obvious that if there should be any material changes:—in composition of natural gas; internal diameter of gas tubing for flame; or rate of gas passage; that there would be corresponding changes in the flame lengths and flame characteristics.

The *prospecting work* is mainly conducted by five groups of three or four men. Four of these groups work in competitive gas territory, while one group works in non-competitive territory. In one section of the city there are main and service lines of the Equitable and Peoples Gas Companies, in another area are the lines and services of the Equitable Gas Company and the Manufacturers Light and Heat Company, and in a third area there are the lines only of the Equitable Gas Company. All leaders of the prospective groups were trained in the laboratory in the Mellon Institute under the direction of the Hope Natural Gas Company's Fellowship and by actual service with the inspecting groups. All the work of the prospecting crews is done in cooperation with the district offices of the three gas distributing utilities. The information gained as a result of inspection is allocated to the several leaders of the prospecting crews. This is used as a basis or guide for the *underground location of the actual source of gas leakage*. Each prospecting group is provided with all of the available equipment of the inspecting group and in addition with properly constructed bars, hammers, bar pullers, etc. Air compressors are always available and these greatly facilitate the work. Especially is this so in the downtown area where a great amount of work must be done quickly during the night hours when traffic conditions will permit.

Locating Conduit Lines

Prior to any prospecting work preliminary information is secured from officials of the Bell Telephone Company and the Duquesne Light Company relative to the location of underground conduit lines. The activities of each prospecting group are reported daily. Carefully prepared maps are made which embody the results of the prospecting work and these are used as guides for the corrective work. Prospecting for gas leakage has become so systematic that there is no longer any guess work about the actual underground location of the leakage. Four out of five locations which have been given by the prospective groups have resulted in the immediate uncovering of a defective line or gate.

The *corrective work* consists of the *actual uncovering of the faulty condition, the making of the necessary repairs, the refilling of the hole and the resurfacing of the street or alley*. In most instances the corrective work is done by special crews maintained for this purpose by the several district offices of the three gas utilities. Scarcely a day passes that there are less than five crews of men engaged in the work. After the repairs have been made, the condition is rechecked by both the prospecting and inspecting groups. The results of the corrective measures are comprehended regularly by a three months' report. Between November 1, 1928, and June 1, 1935, 27,661 major repairs were made. The corrective work has been done in a thorough and efficient manner. The general public has little or no knowledge of the great expense which the utilities have incurred in making the streets, alleys and premises safe. The main thought of the work has been service and safety. A cordial public relationship has been established and a fine cooperative spirit between the public and the utilities has been developed. It would be difficult to evaluate this relationship.

In the event of fires and explosion, regardless of the cause or causes thereof, men of the inspecting, prospecting and corrective groups are available for investigational work. As soon as notice is received from the Police or Fire Departments the most available crew of men is immediately dispatched to the scene of the fire or explosion and it cooperates with service men from the utilities, the Fire Department and the Police Department in ferreting out the cause or causes thereof. In many cases it has been found that the fire or explosion was in no way connected with gas leakage, but was due to careless handling of dry cleaning fluids, the manufacture of illicit liquors, etc.

Daily Reports

The *reporting work* consists of the following: First, daily reports, in typewritten form and with appropriate maps and drawings. These are sent to the designated officials of the four participating utilities. Second, progress reports, of the general activities, are made from time to time. Each progress report is made up when the inspecting crew has completed the location and description of each five hundred faulty conditions. This report includes sample, letter, sample number, location, kind of street opening, lettering on street opening and percentage of gas found. Third, a six months' report of the work of the inspecting, prospecting and corrective groups is made. The street openings are classified into manholes, gate boxes and curb boxes. Each class of opening is studied separately and the gas leakage condition therein is analyzed from the viewpoint of the natural gas content in the sample collected. During the year March 1,

1934, to March 1, 1935, 12,953 manholes were inspected, 76 were found faulty and of the faulty ones 42.1% had an amount of natural gas within the limit 25% to 49%; 13,774 gate boxes were inspected and 1,006 were found faulty; of the faulty gate boxes 66.89% were within the range 25% to 49%; and 42,078 curb boxes were inspected, 364 of which were faulty. 45.88% of the faulty curb boxes were within the range 25% to 49%. A total of 68,805 street openings was inspected and 2.10% of these were found faulty.

The repair work of the corrective groups has been classified as: main line, services, gate and meter. Repairs were as follows: main line 893; curb boxes 1509; gates 42; and meters 20; or a total of 2,472 repairs in the year period.

Fourth, special reports, which embody the results of investigation of fires and explosions, are prepared. These reports are available for the use of the legal departments of the participating utilities.

The reporting end of the Commission is its clearing house. The leaders of the inspecting and prospecting groups report each day at noon by telephone so that complaints received during the morning may have prompt attention, emergencies may be met, and the general work of the Commission expedited. Two general conferences of the leaders of all groups are held each day—one early in the morning, and the other later in the day.

The *creative* work of the Commission is done as emergencies arise and conditions require by all members of the Commission. This phase of the Commission's activities is the one which taxes and tests the resourcefulness of its members. The prompt rendition of service when service is required is the best proof of the interest of the utilities in the public's welfare. Numerous conditions have arisen which have necessitated the creation of new methods of procedure. In many instances there were no established precedents. The method of trial and error was used. Many gracious letters have been received which forcefully evidence the public's appreciation and interest in the service which has been rendered. A satisfied clientele is the utility's greatest asset. In a period, such as that through which we have been passing during the past two years when adverse and destructive legislation has been threatened in an effort to exploit the utilities, constructive thinking and action rather than resistance or antagonism would have been of more value. There are several obvious ways of enhancing cordial public relations which have not been tried and which merit, at this time, profound consideration. Too much has been taken for granted relative to the competitive gas and electric situation. Competitors in the electric field have sensed the temper of the public and have acted accordingly. The gas utilities must resell the idea of gas for its flexibility, convenience, safety, and economy if the gas industry is to progress in accordance with its intrinsic merits. It is through creative service and thoughtful salesmanship that the utilities will be able to level the barriers which exist.

The foregoing is an outline of the general activities of the Commission. However, there are many other interesting special features of its efforts. Reference is made to the work of inspection and repairs in schools (public and parochial), hospitals, theatres and churches. The following resume may be of interest in this connection:

(1) 71 Motion picture theatres have been inspected. Of these 40 have been found to show gas leakage conditions. 129 repairs were made in the 40 theatres;

(2) 21 Hospitals and nurses' homes were inspected and gas leakage conditions were found in all of these. 751 repairs were made to eliminate this leakage;

(3) 249 Public and parochial schools were inspected and gas leakage conditions were found in 181. The number of repairs which were necessary to correct the leakage was 1,022; and,

(4) 355 Churches and church buildings were inspected and gas leakage conditions were found in 294. It was necessary to make 2,136 repairs.

The following is a summary of the repairs, by classes of fixtures, which were made in theatres, hospitals, schools and churches:

SUMMARY

	Theatres	*Hospitals*	*Schools*	*Churches*	*Totals*	*Per Cent*
1. Service Lines	0	1	2	21	24	0.59
2. Meter Connections	19	57	126	129	331	8.20
3. Meters	4	7	21	10	42	1.04
4. House Lines	38	9	30	184	261	6.46
5. Wall Brackets, Gas Jets, etc.	8	42	172	134	356	8.82
6. Stoves	12	31	44	196	283	7.01
7. Hot Plates	9	150	94	135	386	9.56
8. Water Heaters	20	18	73	106	217	5.37
9. Ranges	0	112	94	644	850	21.05
10. Gas Boilers	8	8	11	37	64	1.58
11. Gas Cocks	11	308	351	534	1204	29.82
12. Regulators	0	8	4	8	20	0.50
Totals	129	751	1022	2136	4038	100.00

Other fields of special effort are those of: (a) investigating fires and explosions which are alleged to be of gas origin; and (b) reported cases of carbon monoxide poison due to improper adjustment or venting of appliances or wasteful use of natural gas. Many of the Utility Survey Commission are trained in first-aid work.

It is believed that the distribution departments of all gas utilities will find interest in the results of the systematic work which has been done. Work of this kind has high insurance value.

National Safety Council Elects Godwin

ROY M. GODWIN, director of safety, Philadelphia Electric Company, was elected general chairman of the public utilities section of the National Safety Council at the recent convention in Louisville, Kentucky. The public utilities section is the largest section of the Council.

Mr. Godwin is a past chairman of the Accident Prevention Committee of the American Gas Association. He is also a member of the Accident Prevention Committee of the Edison Electric Institute.

Dale Succeeds Mulholland in Indiana Company

W. MARSHALL DALE of Indianapolis has been named vice-president and general manager of the Indiana Service Corporation to succeed S. E. Mulholland, who resigned from that position and was placed on the retired list December 12, after forty years of continuous service in the utility field.

Mr. Dale is treasurer of the Public Service Company of Indiana and also is a director of that company. He will take over his new duties in Fort Wayne, January 1.

Mr. Dale has been active in the utility field since 1913, when he entered the employ of the Kentucky Utilities Company. He later became manager of its Virginia properties and in 1920 he was made manager of the investment department of that company, with headquarters in Louisville.

On completion of the coordinated operation of the Public Service Company of Indiana and other public utility and transportation companies in central and southern Indiana he became treasurer of all companies within the group.

Has Notable Career

Almost all of the years that Mr. Mulholland has spent in the utility field have been in an executive capacity. He entered the employ of the old Logansport and Wabash Valley Gas Company, a property of the Dieterich-Murdock interests, January 1, 1895, as a general bookkeeper. In 1900 he was transferred to Lima, Ohio, as manager of what now is the West Ohio Gas Company. When the natural gas supply failed in 1908 he was transferred to Fort Wayne to succeed Henry C. Paul as manager of the gas property there. He also became assistant general manager of the other properties of the Dieterich-Murdock interests in Decatur, Bluffton, Wabash, Peru, Logansport, Lafayette, Frankfort, Lebanon and Crawfordsville.

About twelve years later the United Gas Improvement Company of Philadelphia, Pa., purchased the Fort Wayne property and Mr. Mulholland was continued in charge as vice-president and general manager. He continued to operate these properties after their purchase by the Insull interests in 1925. He also at one time served as vice-president in charge of production of all Indiana gas properties of the Insull interests except those in the northwest corner of the state.

On the death of Robert M. Feustel, president of the Midland United Company and head of the Indiana Service Corporation, Mr. Mulholland took over the management of the Indiana Service Corporation, along with the Northern Indiana Public Service Company property here. For the last year, since the separation of the management of the two utilities, he has devoted his time exclusively to his duties as vice-president and general manager of the Indiana Service Corporation.

Few other men in Indiana have been identified so actively with both the natural and manufactured gas industry as has Mr. Mulholland. He was the second president of the Indiana Gas Association and now is a director of that organization. He has served on various committees of the American Gas Association and is known throughout the utility industry for his service record.

Mr. Mulholland was instrumental in planning the erection of the three and one-half million dollar gas plant in Fort Wayne and also in the construction of the Utility Building on East Wayne Street, on the site of the old "bus barn."

Westchester's Model Home Features Gas Equipment

ANNOUNCEMENT was made recently that the 1936 Westchester County, New York, Model Home, which is scheduled to open the latter part of February, will have complete equipment of gas-burning units. House heating, air-conditioning, refrigeration, a gas range and an automatic gas water heater will all be featured as representing the last word in this part of the home equipment from the standpoint of efficiency, dependability, convenience and economy. The dwelling, located just off the famous Bronx River Parkway, near Scarsdale, will be the first sponsored "All-Gas" Model Home in Westchester.

Prompted in large measure by the recent reductions in gas rates in Westchester, the Building Committee of the Exposition under whose auspices the house will be shown, decided to have the gas units installed in the model home. Engineers of the Westchester Lighting Company have practically completed plans for installing the gas heating and air-conditioning systems. The gas appliances, such as an automatic water heater, refrigerator and up-to-date kitchen range can be readily installed when the home nears completion.

Heretofore, similarly sponsored model homes in this section contained modern cooking units and refrigerators operated by gas but have not gone into the more modern idea of using gas for fuel and for humidifying, cleansing and circulating the air, nor the separate automatic gas water heater.

Since the new low gas rate became effective recently in Westchester there has been a marked increase in the demand for automatic water heaters and gas house heating; in fact more than 400 homes have changed to gas in the last few months.

The model home will be open to the public until the close of the Westchester County Better Homes Exposition, which will be held in the County Center, White Plains, N. Y., May 12-20. The model

home, built in conjunction with a similar exposition a year ago, drew more than 40,000 visitors during a six-weeks period of showing, and it is expected that more than 100,000 persons will visit the 1936 Model Home.

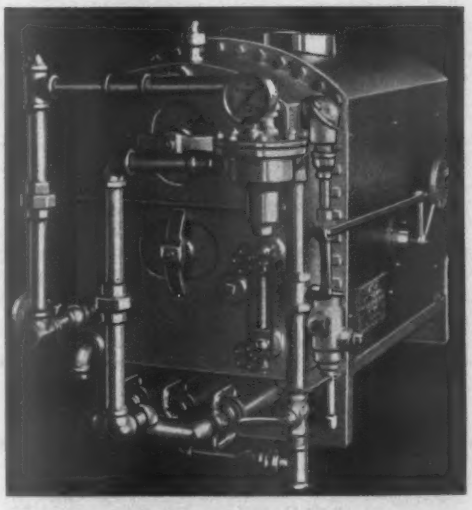
Already numerous persons are stopping at the site to inspect its construction details. Westchester County Better Homes Exposition cooperating with the Federal Housing Administration, backers of the project, have made every effort to incorporate the most modern and sound practices in its construction.

Special Gas Boiler Steams Bread in the Making

MANY housewives do not know that nearly all loaves of bread they buy at bakeries or from corner grocery stores are give a "Turkish bath" while they are being baked. These "Turkish baths" are a very important part of baking bread in commercial bakeries, and no well-equipped bakery is without a boiler for supplying steam to the ovens while the bread is baking.

A liberal supply of good hot steam adds the finishing touches of color, smoothness and uniformity that have come to be recognized features of bakers' bread, whether produced for home consumption or for service in swanky hotels, clubs and restaurants.

We are all familiar with steam; how it appears as a white vapor and how it appears particularly hot as it gushes forth from a kettle. But steam in a bake oven has no color and is much hotter than the familiar steam in a kettle.



A typical installation

Almost every kind of boiler has been used in bakeries for oven steaming. Experience, however, shows that the steam need not leave the boiler at more than five or seven pounds pressure, as the surface of the bread will become amply moist with this low-pressure steam. It is moisture evenly distributed on the surface of the bread that the baker strives for. In fact, high-pressure steam is said to be an actual detriment to furnishing the expected amount of moisture.

All of which has lead to the introduction of gas boilers that produce custom-made steam for bake ovens. These cleverly designed gas boilers can usually be set on top of old-fashioned peel ovens, while on traveling ovens they can be placed conveniently close to the business end of the oven, which for steaming purposes means the end where the pans of dough enter.

The new bakery gas boilers are known as Anets Oven-Steamers and are made in Chicago. They are, of course, entirely automatic, which means the baker has more time for making dough. All too frequently the gas load at this point in bake shops is overlooked; which it is hoped industrial gas men will decide is a thing of the past.

Not to be outdone by restaurant and hotels where the bread will be served, our up-to-date baker air-conditions the dough before he puts it in the oven. No he does not, at this point cool it, but he gives it a good treatment of air-conditioning with very dry steam. This takes the place of grandma's old time "rising" and it saves a lot of time over grandma's method. Steam from the special Anets Gas Oven Steamers does the air-conditioning trick too. Bakers' bread gets a cooling air-conditioning treatment after it is baked and before it is wrapped, but that is another story.

Book Review

Stadtgas-Entgiftung. By Dr. Techn. Dipl. Ing. Fritz Schuster. 167 pp. 6 x 9". 19 illus. Pub. by Verlag von S. Hirzel, Leipzig. RM. 7.60.

Dr. Schuster has personally operated the first technical CO removal plant in the world, namely that of the gas works at Hameln, which was built in accordance with the experiments for the Gesellschaft für Gasentfigtung (Non-Poisonous Gas Holding Company). This volume is therefore of particular interest, as it covers not only the experiences and experiments which led up to the practical development at Hameln, but it also covers in considerable detail the basic chemistry which underlies the whole project.

The author has considered all of the possible methods of CO removal, whether by physical, chemical or biological methods. The first part of the book deals with the problem of CO removal as a basis for the technical removal of poisonous properties from gas. The second part of the book goes into the practice of this work, and considers the need for maintaining unaltered the combustion characteristics of the gas—a problem that for a long time was a difficult stumbling block. As this was solved, the technique took rapid strides forward, and has resulted in the system in use in Hameln. Detailed heat balances are given with typical German thoroughness, and the last section of the book deals with the economics. A complete bibliography of publications and patents, covering more than six hundred thirty-three items, concludes the book. Four pages alone are devoted to the patent numbers of the German, English, French, American, Austrian and Swiss patents which are involved in this work.

It is interesting to consider this publication together with the material which was prepared by Dr. Robert Mezger for the 1935 German gas convention. His work appeared in *Das Gas- und Wasserfach,* Vol. 77, Nos. 30 and 31, and suggests one very important additional process which Dr. Schuster has not covered very completely. The work at Hameln uses a single stage, which to date is the only technically developed practical system, but the possibilities of the two stage process suggested by Dr. Mezger should not be lost sight of.

The present book deserves translation into English, for the subject matter is of great interest to many gas companies, even though the cost involved in the removal of CO may appear high in comparison to the benefits derived therefrom.

—C. G. S.

Columbia Gas Course

A NEW circular has been issued on the revised home study course on American Gas Practice offered by Columbia University under the auspices of the American Gas Association. This course is now available in two parts, the first covering production of manufactured gas and the second distribution and utilization of all kinds of city gas. The new arrangement makes it possible for plant or distribution employees to study only those subjects in which they are interested. Copies of the new circular can be secured by writing to Association Headquarters.

Affiliated Association Activities

Oklahoma Gas Measurement Short Course

THE General Committee in charge of the southwestern gas measurement short course held annually in the Spring at the University of Oklahoma, at Norman, Oklahoma, held its first meeting November 25, in Oklahoma City, and organized for the 1936 short course. Dates for the course, which covers three days, will be decided at a meeting early in January.

The committee as organized at the meeting, November 25, includes the following:

R. D. Turner, Skelly Oil Company, Tulsa, chairman of General Committee; Professor W. H. Carson, University of Oklahoma, chairman, Banquet, Entertainment and Local Arrangements Committee; E. E. Stovall, Lone Star Gas Company, Dallas, chairman of Program Committee; Gilbert Estill, Oklahoma Natural Gas Company, Tulsa, chairman of Exhibits Committee; Max Watson, Canadian River Gas Company, Amarillo, Texas, vice-chairman, Exhibits Committee; Ray Rountree, United Gas Company, Houston, Texas, chairman of Committee for Study of Practical Methods; Max Watson, chairman, Publications Committee and G. W. McCullough, Phillips Petroleum Company, Bartlesville, vice-chairman, Publications Committee.

R. D. Hanley, Magnolia Petroleum Company, Tulsa, was elected to membership on the General Committee, which in addition to the foregoing, includes the following:

Paul Stockwell, Gas and Electric Engineer, Corporation Commission, Oklahoma City; A. E. Higgins, Secretary of Natural Gas Department, American Gas Association, Dallas; Wm. F. Lowe, Secretary of Natural Gasoline Association of America, Tulsa; W. R. McLaughlin, Pittsburgh Equitable Meter Company, Tulsa (General Chairman 1934); G. P. Bunn, Phillips Petroleum Company, Bartlesville; J. H. Satterwhite, American Meter Company, Tulsa; G. B. Lane, Foxboro Company, Dallas, Texas; L. G. Rheinberger, Sinclair Oil & Gas Company, Tulsa; V. C. Jarboe, Empire Companies, Bartlesville; Fay C. Walters, Panhandle Eastern Pipe Line Company, Kansas City, Missouri; Earl Kightlinger, Arkansas Natural Gas Corporation, Shreveport, Louisiana.

Former chairmen of the General Committee now ex-officio members are:

D. C. Williams, Kay County Gas Company, Ponco City; John H. Baxter, Inland Gas Company, Ashland, Kentucky; E. A. Clark, Columbia Gas and Electric Corp., Pittsburgh, Pennsylvania; F. D. Franks, Cities Service Gas Company, Bartlesville; D. A. Sillers, Lone Star Gas Company, Dallas, Texas; C. B. Day, Consolidated Gas Utilities Company, Blackwell and B. L. Maulsby, Oklahoma Natural Gas Company, Tulsa.

The 1935 short course held in April had a registration of 575 representing twenty-two states and three foreign countries.

N. E. Association To Meet in Boston

PRELIMINARY arrangements have been completed for the annual meeting of the New England Gas Association to be held in Boston, Mass., February 13 and 14, according to an announcement by Clark Belden, executive-secretary. The annual directors' dinner will be held Wednesday evening, February 12, prior to the official opening. It is also expected to hold a home service luncheon during the convention.

A feature of the opening session will be the presentation of awards to the winners of the appliance sales contest among companies and to those who have submitted the best papers in each division during the year. Speakers at this session include Herman Russell, vice-president, American Gas Association; R. H. Knowlton, president, New England Gas Association; Walter C. Beckjord, vice-president, Columbia Gas and Electric Corporation, Pittsburgh; and Clark Belden.

House heating sales methods will be discussed in the first paper Thursday afternoon by S. F. Morgan, of New Bedford. Other important topics and speakers at this session are: Importance and Possibilities of Commercial and Industrial Sales, Cecil Ogren, Malden; Operating High Spots, C. P. Warner, Manchester; Social Security

---

Convention Calendar

JANUARY

28-31 American Institute of Electrical Engineers
New York, N. Y.

FEBRUARY

6-7-8 A. G. A. Eastern Natural Gas Sales Conference
William Penn Hotel, Pittsburgh, Pa.

13-14 New England Gas Association
Hotel Statler, Boston, Mass.

13-14-15 A.G.A. Mid-West Regional Gas Sales Conference
Sherman Hotel, Chicago, Ill.

19-21 Gas Institute of New Zealand
Christchurch, N. Z.

19-21 Southern Gas Assn. Annual Convention and A. G. A. Sales Conference
Roosevelt Hotel, New Orleans, La.

MARCH

2- 6 Regional & Group Meetings of A.S.T.M.
Pittsburgh, Pa.

9-10 A. G. A. Industrial Gas Section, Industrial Gas Sales Symposium
Detroit, Mich.

APRIL

2 New Jersey Gas Association
Berkeley Carteret Hotel, Asbury Park, N. J.

6- 7 A. G. A. Distribution Conference
Memphis, Tenn.

13-15 Mid-West Gas Association
Minneapolis, Minn.

29-May 1 Missouri Association of Public Utilities
Jefferson Hotel, St. Louis, Mo.

MAY

5- 7 Pennsylvania Gas Association
Lodge of Sky Top, Pa.

5- 8 A. G. A. Natural Gas Department
Baker and Adolphus Hotels, Dallas, Texas

Wk. 11th National Fire Protection Assn.
Atlantic City, N. J.

25-27 A. G. A. Production and Chemical Conference
New York City

26-27 A. G. A. Industrial Gas Section, Commercial Gas and Hotel and Restaurant Sales Symposium
Washington, D. C.

JUNE

17-20 American Society of Mechanical Engineers
Dallas, Texas

29-July 3 American Society for Testing Materials
Atlantic City, N. J.

JULY

8-10 29th Annual Convention Canadian Gas Association and Northwest Conference Pacific Coast Gas Association
Hotel Vancouver, Vancouver, B. C.

SEPTEMBER

7-12 Third World Power Conference
Washington, D. C.

OCTOBER

Wk. 26th A.G.A. Convention
Atlantic City, N. J.

Legislation, C. J. Walker, Boston; Market Analysis, William Webster, Providence; and Long-Term Appliance Financing, H. L. Dalbeck, Cambridge.

Such vital and timely subjects as "Why National Gas Advertising?", "Economics of the Gas Industry," and "Public Relations," are on the program to receive consideration during the closing session. The principal speakers on these topics will be: H. R. Sterrett, New Haven; Herman Russell, Rochester; and E. R. Acker, Poughkeepsie.

National contests for the promotion of range, water heater and refrigerator sales sponored by the American Gas Association will be discussed by R. J. Rutherford, Cambridge. Arrangements are also being made for a special hook-up of the regular "Mystery Chef" broadcast on Friday at 10:30 A.M. This program, which is sponsored by gas companies representing over five million meters in the Eastern seaboard, is broadcast regularly over an N. B. C. network.

The following subjects and speakers complete the tentative program: Kitchen Heating Developments, R. M. Keeney, Hartford; Management Reviews Home Service Possibilities, J. J. Quinn, Boston; and The Importance of Service, David Price, Waterbury.

New Jersey Gas Association

DURING November over 2,200 persons attended five regional meetings held at five different parts of the state as one of the activities of the New Jersey Gas Association. The meetings at Hackensack, Newark, Asbury Park, Atlantic City and Camden showed greater attendance and more interest than in previous years.

The program of each meeting was built around two papers. One entitled "Gas Meters Tell the Truth" was written by Joseph A. Hopkins, of Public Service Electric and Gas Company, and dealt with the many steps taken by gas companies to assure gas meter accuracy. Twenty-eight slides accompanied the presentation of the paper, all showing the precision used in the shop treatment of gas meters.

The second paper, prepared by Lewis A. Becker, of the Elizabethtown Consolidated Gas Company, discussed the importance to individuals and companies of employee selling. As an indication of this value, Mr. Becker pointed out in his paper that in one gas company of the state, one hundred employees had turned in leads resulting in the sale of $30,000 worth of merchandise during the first six months of 1935.

After presentation of the papers, each meeting was turned into a social occasion featured by entertainment and refreshments. At all meetings a Prize Paper Contest, carrying $100 in prizes, was announced.

The regional meeting movement was started four years ago as a means of bringing the Association to its members located in all parts of the state. That the meetings have established their value is indicated by the steady increase in membership during the period.

Executives of the ten gas company members feel that these meetings have considerable educational and morale-building value and have supported the movement generously. John D. Alden, of Jersey Central Power and Light Company, is credited with originating this successful effort.

Preston D. Gardner, of Public Service Electric and Gas Company, is the current year's general chairman of the Regional Meetings Committee. Herbert E. Cliff, of Public Service, is president; William S. Potter, of Elizabethtown Consolidated Gas Company, is vice-president; and George B. Webber, of Public Service, is secretary-treasurer of the Association.

Arkansas Convention Attracts 200 Delegates

A. G. WHIDDEN of Pine Bluff, director of public relations for the Arkansas Light and Power Company, was elected president of the Arkansas Utilities Association which brought its twenty-fifth convention to a close at Hot Springs, November 26. More than 200 members and visitors attended the meeting, which was the first held by the association in four years.

Mr. Whidden succeeds W. S. Van Sickel of Fort Smith, manager of the Arkansas division of the Oklahoma Gas and Electric Company. Other officers elected were Paul Clay, manager of the Arkansas Natural Gas Company, Texarkana, first vice-president, and James Hill, president and general manager of the Missouri-Arkansas Power Company, Blytheville, second vice-president. R. L. Ritchie, Pine Bluff, was re-elected secretary-treasurer.

Speakers on the two-day program included P. A. Lasley, chairman of the Arkansas Department of Public Utilities; J. C. Hamilton, rate and valuation engineer for the Arkansas Natural Gas Corporation; Edwin Vennard, rate engineer for the Middle West Utilities Company; C. B. Wilson, Little Rock Gas and Fuel Company; and W. G. Givens, Arkansas Power and Light Company.

Those on the general discussion programs included Harvey C. Couch, president of the Arkansas Power and Light Company, Pine Bluff; Dr. Gus W. Dyer, Vanderbilt University; Charles C. Fiechtner, University of Arkansas; J. F. Owens, Oklahoma utility executive; Bernard F. Weadock, Edison Electric Institute, New York; and C. F. Byrns, editor of the Fort Smith Southwest American.

M. I. T. House Heating School

WHAT is probably the first gas house heating school sponsored by an association at a recognized educational institution, has been announced by the Industrial Division of the New England Gas Association.

Opening January 27 and continuing for 5½ days, through February 1, the school will be conducted at Massachusetts Institute of Technology, Cambridge, Mass., under the direction of Professor Gordon B. Wilkes. Professor Wilkes supervised the successful industrial gas courses at M. I. T. sponsored by the N. E. Industrial Division during 1922-1929. He also supervised the important M. I. T. water heater tests for the American Gas Association in 1934-1935.

The object of the school is to assist gas companies to secure more house heating sales as a result of an intensive gas-heating-development training. It is expected to provide a thorough sales training in gas heating for the engineer and a necessary foundation upon which the salesman can build successful sales in the face of competition. This idea carries throughout the school.

The committee in charge of the course plans to accept a limited number of enrollments from outside of New England. The registration fee is $28.50 and enrollment is limited to 60 men.

The Annual Payroll of the gas industry is about $168,000,000.

Accounting Section

Receipt and Dispatch of Orders

It is interesting to note that another splendid paper dealing with this subject, prepared by William R. Wallman, of the Niagara Hudson Power Corporation, Syracuse, N. Y., outlines the same problems and explains how it was worked out by that organization.

While it is impractical to publish both papers, it is particularly interesting to observe that separate studies made at the same time and independent of each other resulted in the adoption of similar procedures and equipment in both cases.

—Editor.

By H. S. SHEVLIN

The Philadelphia Gas Works Company, Philadelphia, Pa.

TIME: 11:00 a.m. in The Philadelphia Gas Works Company.

PLACE: The Telephone Service Division.

Zip-Zip (Automatic Auditory Signal).

"Gas Company."

"My oven won't bake properly."

"I'm certainly sorry to hear that. If there is anything wrong with the range I'm sure we can repair it. Where shall we send our man?"

"1916 N. 15th Street. This is Mrs. Philadelphia. When can I expect your man? I want to use the oven for a dinner party this evening."

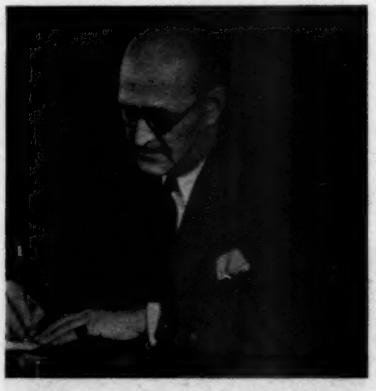
What can the Telephone Representative do under such circumstances? What authority has he or she?

Thirty-five thousand telephone inquiries a month must be answered intelligently and skillful performance must follow promptly in order that Mrs. Philadelphia may receive satisfactory service from her gas company twenty-four hours daily.

How It Is Accomplished

Appearing in our local telephone directory is one number for service. When this number is dialed the call is received not by a telephone operator who, after hearing the customer's story, must switch the call to the proper division where the story must be repeated, but it is received at a thirty-position telephone desk known in the telephone world as a No. 3 automatic turret (see fig. 1), where the calls are automatically distributed in the order in which they are received. This turret is operated by a group of Contact Representatives who have been trained to represent the Gas Company so that almost any type of inquiry or irregularity whatsoever can be answered satisfactorily by the first voice the customer hears. Early in the conversation the customer's telephone number is obtained and should the inquiry be of such a nature as to require considerable research the customer is not asked to wait, but is told we will telephone when the information has been obtained. Never under any circumstances is a customer required to make additional calls, transferred or asked to repeat her request to another employee. As this group represents the Gas Company, any statement or promise made is strictly adhered to in carrying out its decision.

To accomplish these results it was necessary to train a special group of employees to properly analyze customers' inquiries, requests and complaints as to type and importance and to establish Company policies as to how the major points should be treated by Telephone Contact Representatives. This was done by the compilation of case problems covering specific cases as well as general telephone technique. By the latter we mean training in courtesy, voice, and assistance to customers in stating their problems; how to handle a situation with dispatch; how to secure information from customers without annoyance, and the like. This training was done under exact operating conditions. Learners were made to think out their own solutions to various problems, under proper guidance.



H. S. Shevlin, supervisor, at his desk

In a conference room telephone equipment was installed to permit eight students to listen in simultaneously on conversations between the instructor (taking the part of a customer) and a representative acting as a turret board Telephone Contact Representative. The instructor was supplied with a case problem and the actual problem was re-enacted. At the expiration of the contact the group entered into a free discussion to determine the best method for handling this particular type of problem along with the issuance of the proper order. From the progress that individuals made in these group conferences we were able to determine whether they were suitable for the position of Telephone Contact Representative.

The turret board is in operation twenty-four hours a day. The personnel varies in number during these hours from two to seventeen, governed by the peaks and valleys of the telephone traffic. The day force is in control from 7:30 a.m. until 6 p.m. at which time the turret board is taken over by two night operators. However, forty-five persons have been trained who, while they are assigned other duties and are located in other divisions, can be called into service on the turret board at a moment's notice. During the emergency that arose in the winter of 1933-34 due to the extremely cold weather, it became necessary to operate twenty-nine of the thirty positions. On February 9, 1934, we received 4,566 telephone calls between the hours of 7:30 a.m. to 8:30 p.m.

When Mrs. Philadelphia telephones to have her gas range adjusted, an order is originated in duplicate showing type of work to be done and specifying the date and time to call in accordance with the promise made by the Telephone Contact Representative. The calling time is determined by the nature and importance of the work involved. No calling promise is made on orders for minor adjustments unless a specific date and time is requested by the customer, thus enabling the Distribution Department to maintain a uniform flow of work. The order is then placed in a metal trough pictured in figure 1, extending down the center of the table through which runs a conveyor belt traveling 425 feet per minute. On this belt the order is carried to the Open Order Desk. (see fig. 2.)

Open Order Desk

At this desk all orders and memoranda are ejected from the belt and it is the responsibility of one clerk to scrutinize them for correctness of data, issuance of proper forms, etc. Memoranda pertinent to accounting problems which, as explained further on in this article, may be a request for an extension on the payment of a bill, a duplicate bill or other information are dispatched to the proper division caring for these details. Orders to be executed by the Distribution De-

partment are issued in duplicate and at this point the duplicates are detached from the originals and filed in a specially designed file until the work is completed. Before the original is released to the dispatching desk a check is made to ascertain whether or not a previous order of the same nature is in file. This check eliminates unnecessary visits by the Distribution Department. All "open"orders are available to any of seven clerks operating this desk. Information as to the status of an order is therefore instantly available when answering customers' inquiries which may originate from a customer by telephone through the turret or from a Contact Representative serving a customer at a district office.

The night force consists of six clerks. In addition to operating the turret board they remove the duplicates from the file when the orders have been completed. On orders which have not been completed the same day, the reasons for such incompletion are noted on the duplicates, making a ready reference concerning the status of the job.

Work Order Dispatching

After check has been made at the Open Order Desk the original order is replaced on the conveyor belt and then carried to a special check file. If the order is for servicing an appliance, a file is consulted to determine whether the appliance is one of an automatic type which requires specialized servicing. This file consists of a record of locations of all automatic appliances in service.

If the order is for a new customer requesting gas service, the order is checked against a dead service record. This prevents dispatching a man to turn on gas who is not equipped to set a meter.

Certain collection records are also contained in this file and are consulted to prevent the turning on of gas for certain accounts without the approval of some one of authority in the Collection Division.

After these checks, orders are again placed on the conveyor belt and carried to the dispatching desk (see fig. 3), where they are sorted into the various types of orders and into geographical sub-divisions of the City. In approximately two minutes after Mrs. Philadelphia completes her telephone conversation the order is in the hands of the Dispatching Clerks. At the dispatching desk telephone calls are received from the street force of the Customers' Service Division over nine unlisted numbers at scheduled calling times. These lines are used exclusively by these employees and are received by the Dispatching Clerks through the automatic telephone system without passing through our manual switchboard. Orders for completion the same day are telephoned to these workmen, while those for future dates are sorted and racked for dispatching to workmen leaving the shop the next day.

Figure 2. Open order desk

Figure 1. Thirty-position telephone desk (No. 3 automatic turret)

Accounting Inquiries

Should Mrs. Philadelphia request an extension on the payment of her bill, the Telephone Contact Representative grants the extension after determining the status of the account. Should the request be for a duplicate bill, the Accounting Division is notified by memorandum to issue such a bill. Should the inquiry be in reference to an "open" order, the Open Order Desk is contacted.

When it is necessary for the Telephone Contact Representative to obtain information from records in other divisions, all that is necessary is for the representative to dial a telephone number connecting him with another clerk in one of our various divisions who is located adjacent to the records. This is accomplished within the hearing of the customer, who is given attention during every second of the transaction. There is no waiting, no transfer, no "hanging on" a silent line, wondering if she is forgotten.

(Continued on page 37)

Commercial Section

C. E. Bennett, Chairman J. W. West, Jr., Secretary F. M. Banks, Vice-Chairman

Aggressive 1936 Sales Program Outlined

WITH greater responsibility than in any of recent years to increase the sale of gas and gas appliances the working committees of the Commercial Section have prepared a comprehensive program of action for the year 1936.

The foundation for the year's program was laid at the meeting of the Managing Committee in October during the A. G. A. Convention at Chicago. Since that time there have been meetings of individual committees and groups to further effect the organization of the Section. Perhaps the most important of the activities to be undertaken by the Section is a series of three rousing sales contests involving the major appliances of the domestic load: ranges, refrigerators and water heaters.

The Water Heating Committee, under the chairmanship of R. A. Koehler, Public Service Electric and Gas Company, Newark, N. J., will for the first time conduct a national sales contest. The contest will be held during the eight months' period beginning February 1 and ending September 30. Each participating company will select two months, not necessarily consecutive, of this period for intensive promotion of automatic water heater sales. Company prizes will be awarded for the greatest number of sales during the two months' period and also for the entire eight months' period.

Following up last year's highly successful contest, the Domestic Range Committee plans to hold its national contest during the six months of February 1 to July 31. Competing companies will select two months, not necessarily consecutive, of this period in which to concentrate their greatest sales effort. Company prizes will be awarded for the best two months' showings and for the best record during the entire six months' period. The contest will be directed by R. J. Rutherford, chairman of the Domestic Range Committee.

C. E. Bennett, Chairman, Commercial Section

F. M. Banks, Vice-Chairman, Commercial Section

Profiting from experience gained in previous contests, the annual contest of the Refrigeration Committee, B. H. Gardner, chairman, is expected to result in a greater number of sales than the 1935 contest, in which companies having a total of nine million meters were registered. The contest will be held during the full three months' period of April, May and June.

A complete series of monthly prizes is being arranged for the ranking individual salesmen in each of the contests and for those salesmen making the best records during the entire contest. The bulk of the cash awards in each contest will go directly to the men in the field to insure their best efforts throughout the campaigns. Each activity is designed to stimulate the sales of cooperating dealers. The contests have been coordinated to permit any operating company to participate in all three activities.

Details of the Range and Water Heating Contests will be distributed during the last week in December, and the prospectus of the Refrigeration campaign will be sent out about March 1. Special provision has been made for registration by companies not members of the American Gas Association.

B. H. Gardner, Chairman, Refrigeration Committee

R. A. Koehler, Chairman, Water Heating Committee

H. O. Loebell, Chairman, House Heating and Air Conditioning Committee

Appliance Financing

The terms of sales offers being made by gas companies and individual retail dealers throughout the country on various classes of gas appliances are expected to be one phase of a study carried on under the direction of Merrill

W. H. McInnis, Chairman, Space Heating Committee

J. R. McQueen, Chairman, Appliance Servicing Committee

R. J. Rutherford, Chairman, Domestic Range Committee

M. E. Skinner, Chairman, Appliance Financing Committee

H. H. Swenson, Chairman, Home Modernization Committee

E. Skinner, chairman of the Appliance Financing Committee. At a meeting in New York, November 15, it was agreed that this subject and that of reviewing the existing plans and programs for financing company and dealer sales should be incorporated in the work of a subcommittee. Another subcommittee will study the subject of cooperation with master plumbers. An analysis of the relationship between sales by utilities and sales by master plumbers, which was presented at the A. G. A. Convention by John J. Calnan, representing the National Association of Master Plumbers, is being studied with a view to improving cooperative sales.

Appliance Servicing

In the field of appliance servicing a committee has been organized by J. R. McQueen, Washington Gas Light Company, Washington, D. C., chairman, to continue the work of previous committees in the training of personnel, control of cost, improving quality of work and other studies. At a meeting of the committee in New York, November 21, the following subjects were proposed as activities of the committee:

1. Development of a plan for the continuous accumulation of data necessary to keep service manuals or handbooks up-to-date.
2. Development of recommendations covering appliance design from servicing standpoint, i.e., accessibility of parts and safety in servicing; also interchangeability of appliance gas fitting accessories.
3. Accumulation of data bearing on mechanical and other faults, for use of approval requirements committees.

After discussion of activities (2) and (3) it was decided that members of the committee should forward to the A. G. A. Testing Laboratory any suggestions regarding mechanical defects or matters of design which have an important bearing on the cost of servicing appliances or which, for other reasons should be considered in the preparation of future appliance approval requirements.

Reference was made to the recommendation of last year's committee that a report should be issued on the subject of accumulation of field data, with particular reference to water heaters, which would afford each local company a cross-section of data on water heater tank life, flue life, heat control, automatic shut-off devices and other important points for consideration in the formulation of appliance servicing and sales policies.

Home Modernization

H. H. Swenson, The Peoples Gas Light and Coke Company, Chicago, chairman, of the Home Modernization Committee, has outlined eleven objectives toward which his committee is working. They are:

1. To devise effective means of meeting the competition for new business facing us through the vigorous efforts of opposing interests.

First meeting of the 1936 Home Service Committee at Philadelphia, November 22. In the picture are, seated left to right: H. H. Koelbel, Consumers Power Co.; Jessie McQueen, American Gas Association; Beatrice Cole Wagner, The Philadelphia Gas Works Co.; Jane Roberts, Roberts & Mander Stove Co.; Frances McBeath, Consolidated Gas Co. of New York; Helen Smith, Rochester Gas & Electric Corp.; Arra Mixter, Hartford Gas Co.; Jane Tiffany Wagner, Electrolux Refrigerator Sales, Inc. Standing left to right: H. W. Olcott, Jr., The Philadelphia Gas Works Co.; Dorothy Shank, American Stove Co.; Ruth Sheldon, Washington Gas Light Co.; F. H. Trembly, Jr., The Philadelphia Gas Works Co.; Elizabeth Sweeney, Empire Gas & Electric Co.; P. R. Wright, A.G.A. Testing Laboratory; Margaret Nevins, The Syracuse Lighting Co., Inc.; R. A. Malony, Bridgeport Gas Light Co.; Flora Dowler, Binghamton Gas Works Co.; B. T. Franck, American Light & Traction Co.; R. J. Canniff, Pittsburgh Water Heater Co.

2. To assemble and make available correct, specific and up-to-date information on the modernization activities of all companies, either through kitchen planning or home service.
3. To coordinate and publish modernization results and methods applied.
4. To invite interested companies to contact the Home Modernization Committee for assistance in planning a Modernization Bureau.
5. To establish a file of photographs of gas appliance installations in the home to be available for newspapers, magazines, manufacturers and others requiring such photographs for publication.
6. To coordinate gas equipment and appliance information to be distributed to architects and builders, either through Architects Service Departments or through A. G. A. headquarters.
7. To encourage advertising directed to architects and builders.
8. To establish contacts with schools teaching decorative and architectural arts.
9. To record trends in living habits and new equipment.
10. To centralize information about new materials and building practices, making this information available to companies.
11. To make available a portfolio of good building practices to serve as a handbook for companies operating a Kitchen Planning Bureau.

Home Service

A comprehensive plan of work was prepared and discussed by the Home Service Committee at its first meeting in Philadelphia, November 22. The committee, headed by Beatrice Cole Wagner, chairman, decided to continue the regional home service groups as organized last year in connection with the regional gas sales conferences, with a home service program held in connection with each conference.

Subjects to be undertaken by the committee include: an analysis of home calls; a study of the problem of budgeting expense according to the work done in home service departments; preparation of an outline of a training course for new home service employees; assistance to the other Commercial Section Committees in aiding sales plans, and a report on research useful and of interest to home service departments.

One of the functions of the home service committee outlined at the meeting was the preparation of technical material on the subject of refrigeration for use upon request by research departments of colleges. It was also decided to collect information on cold cookery and food preservation, developed upon the basis of consumer interest. A detailed foods demonstration, sales slanted, built around the gas refrigerator is proposed as an additional project.

Further home service projects will include time and temperature study to develop a standard chart incorporating newer knowledge of cookery, a plan to continue the two years' study on equipment courses for colleges, and development of a system whereby college home economics students might secure experience in home service work.

House Heating and Air Conditioning

An intensive study of all elements affecting the house heating and air conditioning load is planned by the House

(Continued on page 39)

Industrial Gas Section

Controlled Temperature Gas Cooking Featured in Twentieth National Hotel Show

C. E. Lucke, Jr.

By CHARLES E. LUCKE, JR.

Chairman, Commercial Cooking & Baking Committee, Industrial Gas Section

CONTROLLED temperatures for large volume cooking were a feature of the gas industry's exhibit at the well-attended twentieth National Hotel Exposition held in Grand Central Palace, New York, November 18-22, which was conducted under the joint auspices of the Display and Contact Committee, D. W. Chapman, chairman, and the Commercial Cooking and Baking Committee of the Industrial Gas Section.

The space used by the gas industry dominated the first floor show area of this famous hall, constituting as it did the largest display ever taken for the exhibition of gas appliances in the history of the exposition. The organizations cooperating with the American Gas Association in the display were Detroit-Michigan Stove Company, Standard Gas Equipment Corporation, American Stove Company, G. S. Blodgett Company, Robertshaw Thermostat Company, and Consolidated Gas Company of New York.

Produced under the supervision of R. M. Martin, display manager of Consolidated Gas Company of New York, the exhibit was well located, attractively laid out, and brilliantly lighted. Coloring of the lower walls was cobalt blue which blended with the vermillion red carpet and the pure white top walls to form an harmonious ensemble which was enhanced by indirect lighting.

Attendance at the show was purposely held below that of last year by rigidly excluding the public. This plan was successful and as a result, all exhibitors commented favorably on the interest shown by the restaurateurs and hotel owners, and were pleased with the numerous sales that were made during show week and immediately following. A great many members of the Industrial Gas Section from up and down the Atlantic seaboard and from the Middle West were present. The Fall meeting of the Managing Committee of the Industrial Gas Section was held on Tuesday of show week so that members of the committee could see the exposition and greet, hotel and restaurant owners from their home cities at the gas booth. Many of them found it so valuable they stayed several days and some were in attendance the entire week.

At a time when the commercial cooking load is being threatened by coal and oil competition, and the counter load by electricity, the show provided an excellent chance to study the features of competitors' appliances. Coal and oil ranges were more numerous than in previous years as were electric counter fryers, broilers, griddles, short order stoves, coffee urns, toasters, roll warmers and the like.

Entrance to the cooperative gas exhibit

Among the "firsts" in the gas industry space were: display of the new Vulcan top temperature control gas range; display of the entire new line of Magic Chef heavy duty gas ranges, bake ovens and broilers, the ranges having been recently added to the American Gas Association Approval List; and a display of the new Garland and Majestic heavy duty ceramic gas broilers.

The American Gas Association booth attracted many hotel men, showing as it did, how easily the temperature of heavy duty ranges can be automatically controlled at a constant level. Side by side were an old-type hotel range of five years ago and a modern top temperature controlled range. Each was connected to a recording thermometer. The top surface of the modern range was held at a temperature of 900 degrees without any attention while, despite efforts of attendants at the booth and some of the visitors, the charts showed that it was impossible to maintain a perfectly even temperature on the top of the uncontrolled range.

In the Consolidated Gas Company section of the display were shown a Surface Combustion conversion burner, Bryant gas boiler, Kompak large volume water heater, gas-fired aluminum stock kettle, a small Rival water heater for use in lunchrooms, and a combination Electrolux refrigerator

Interested visitors looking over the latest gas-fired equipment at the Hotel Show

Individual exhibits of gas-fired equipment at the national Hotel Exposition, Grand Central Palace, New York City

and Quality range. Such counter gas appliances as a Savory toaster and Vulcan short order stove, oyster stewer, griddle and counter fryer were also on display.

The Robertshaw Thermostat Company, through its exhibit of the latest steam table and coffee urn controls, added to the general theme of controlled temperature cooking. A departure in heavy duty range tops, not yet commercially available, was the new tubular top Garland range which is being jointly developed by Consolidated Gas Company and Detroit-Michigan Stove Company.

Other manufacturers who were in the show but not in the gas industry booth, displayed the following equipment: Savory Company—gas toasters, broilers, and counter equipment; Nathan Straus Co.—Welsbach gas broiler and griddle; Griswold Mfg. Co.—large vertical gas broiler; Star Mfg. Company—gas deep fat fryers, counter broilers and griddle; Hill-Shaw Co.—gas short order stoves for coffee making; Pitco Frialators Inc.—gas deep fat fryers; Silex Co.—gas coffee stoves; Automatic Food Shaping Co. Inc.—Welsbach gas broiler; Barth Equipment Co.—gas-heated urns; Glass Coffee Brewer Corp.—gas-heated urns; Cecil Mfg. Co.—gas-heated urns; Faspray Corp.—gas burners; and C. H. Powell Co.—Pitco gas frialators.

Among the exhibitors of competitive commercial cooking equipment and the equipment displayed were: Griswold Mfg. Co.—electric fry kettles, griddles, etc.; Advance Mfg. Co.—electric toasters, grills, waffle bakers; Motor Wheel Corp.—oil ranges and oil bake ovens; Wood & Selick Inc.—oil ranges and oil bake ovens; Independent Oil Burner Corp.—oil bake ovens; Adolf Eccardt—charcoal broilers and Ford briquets; Kolax Inc.—automatic coal ranges with blower; N. Y. French Range Co.—oil and coal stoker ranges, oil bake ovens; South Bend Malleable—oil ranges; Duparqet, Huot & Moneuse—oil ranges; and Silex Co.—electric grills and coffee brewers.

Active Industrial Field Holds Promise for New Year

By J. B. NEALEY

A NEW spirit permeates industrial America, a spirit born of an ascending scale of consumption and production in spite of government interference in business. The fact that in many places there was a real semblance of good times was continually borne in on my mind during a recent six weeks' trip throughout the middle west. All automobile plants visited were working full time while other factories, foundries, steel mills, etc. were working one, two or three shifts. None were idle. Business men are more cheerful than at any time in years although somewhat apprehensive for the future.

J. B. Nealey

I was amazed at the thought that if it were not for the continual fear of governmental regimentation and burdensome taxation, prosperity as great as that in the years prior to 1929 would be ours right now. We are definitely out of the depression as far as business turnover is concerned. Yet with Federal outgo twice its income, some fear that our present prosperity will collapse within a few short months, while many others hold a more optimistic view. There is no doubt but that a few Supreme Court decisions favoring business would release a flood of replacement orders accumulated during a period of five years, a flood that would put this country on its feet in a bewilderingly short time in spite of the all-time record Federal debt.

Take Detroit as an example. Two or three years ago its factories were idle and a large part of its population had migrated. Homes by the thousand were sold for taxes, paper scrip was used in place of money and that at a discount. Today its factories are running full time, the migrated workers have returned, living quarters are hard to get and rents going up every day. Of course, this is chiefly due to the automotive industry, the first to stage a comeback. Business men here more than anywhere else probably in America have reason to rejoice.

Pittsburgh, the seat of the heavy industries, feels the upward trend albeit less quickly. Business men there look for an inflation of some magnitude and expect it to be under way within the next few months. It is their opinion that a business boom would come about naturally if the "breathing spell" would be made permanent at the present time. However, the outlook is better than at any time since the beginning of the depression. Most of the steel mills are running close to two shifts a day. This is in the so-called heavy industries where the going has been the hardest.

My contacts with industrial gas men were quite extensive. The optimism of industry in general was reflected here in large measure. Loads have been lost, some perhaps permanently, but these have been more than made up for by new customers. Sales have been on the increase ever since 1932 but a most welcome acceleration has been in evidence in recent months. The feeling in most quarters is that the load now is permanent.

More and more plant officials and engineers have been "sold" on the idea of gas as a fuel during the past five years who were unable to switch to this fuel through lack of funds and orders. This selling was done by the industrial departments of the individual gas companies backed up by a flood of articles showing gas uses in many plants. These were written and placed with the various trade and technical magazines by the American Gas Association. Now that these orders are being realized a considerable movement in the purchase of gas-fired furnaces has developed. These actually replace other fuels and energy, as the case may be. It might be added that the idea is prevalent that this movement has just started and that the volume of business in sight for the gas companies is considerable. At last the persistent research, development and sales efforts the gas utilities and the American Gas Association have maintained in the industrial field during the past five or more years are bearing fruit.

We have passed that period in which the industrial gas man was handicapped by inability to offer heating machines which could produce the results offered by the equipments of competing heating media.—HALE A. CLARK.

Gas is used in making practically all the millions of tin cans which are so popular in selling motor oil, beer and ale in the modern vogue.

Addresses House Heating Council

AT the sixth annual meeting of the Metropolitan House Heating Council in New York City, December 18, Eugene D. Milener, secretary of the Committee on Industrial Gas Research, delivered an address entitled "Progress in Applying Gas to Summer Air Conditioning."

In his address Mr. Milener emphasized the fact that gas summer air conditioning for industrial, commercial and residential purposes has arrived, and that its future depends entirely upon the manner and extent to which its sales possibilities are promoted. A discussion of the sales plans was held.

Other subjects discussed were winter air conditioning with gas and various sales aspects of gas house heating.

The Metropolitan House Heating Council is sponsored by seventeen gas companies in New York City and vicinity.

Technical Section

Determination of Corrosion Resisting Properties of Metals and Alloys Against Flue Gas Condensate

By FRANK P. MUELLER

Senior Chemist, The Peoples Gas Light and Coke Company, Chicago, Illinois

IN the combustion of either manufactured gas or mixtures of manufactured and natural gas there is formed a product which, when cooled to a temperature where condensation occurs, is highly corrosive to most metals. The principal or active constituent responsible for this is, in all probability, sulphuric acid which results from the combustion of small amounts of sulphur that remain in the gas even after the gas has been carefully purified.

Removal of the last traces of sulphur from sendout gas is neither practicable nor feasible from the standpoint of normal plant operation and even in the event that a sulphur free gas could be made there is a wide difference in opinion as to the extent to which the corrosiveness of the ensuing condensate would be reduced. Rather rigid plant practice seldom produces a gas having a sulphur content much below 1 to 2 grains per 100 cubic feet and in the combustion of such a gas, condensate containing about 50 parts per million of sulphuric acid can be expected. This seemingly dilute acid attacks most metals with surprising rapidity and severity and even many of the so-called corrosion resisting alloys are badly affected in less than two months' time.

A question is to be raised in regard to the relative corrosiveness of flue gas in the vapor or gaseous phase as compared to the same products condensed to the liquid phase. While some effort has been made to determine the corrosive properties of flue products in the vapor form, the results have not been sufficiently convincing to warrant publication. Tests seem to indicate however, that the condensed flue products exhibit the severest action upon metals and it is with flue gas condensate that most of our work has been done.

The Corrosive Properties of Flue Gases and of Products Resulting From the Condensation of These Gases

Normally, gas-fired boilers are intermittent in operation and during the time when firing is either entirely shut off or greatly reduced, cooling of the ducts, which convey the flue products to the chimney, occurs. Should the temperature of the flue pipe or of the chimney fall below the temperature at which condensation takes place, water containing small amounts of sulphuric acid can be expected to form. The cycle is continuous in which condensation, evaporation, and probably concentration of acid takes place and unless a flue pipe has been properly chosen, severe corrosion is very apt to ensue. It was in the effort to determine the metal or alloy most suitably adapted for such conditions that the tests herein described were made.

Nature of Test

Data which is obtained in the laboratory from tests which supposedly simulate actual field conditions must be used with a certain amount of discretion, since at best it is seldom strictly reliable. This is neither a reflection upon the laboratory nor upon those engaged in an investigation. Rather, it is the result of an inability to duplicate field conditions to a high degree of certainty. If however, information can be obtained which, while not being strictly indicative of results that would be obtained in the field, does have interpretive value and can be used to good advantage for purposes of comparison, the laboratory test can be justified.

An accelerated corrosion test of metals and alloys proposed for flue pipe use has been in progress at the Laboratory of The Peoples Gas Light and Coke Company of Chicago, Illinois, for more than six years. This test consists of immersing the material to be tested in separate baths of condensate which is obtained by burning gas in a Referee apparatus and cooling the combustion products to a point where condensation takes place. The samples are carefully weighed prior to their subjection to test and periodic inspections and reweighings are made to ascertain the extent to which the strips are affected.

In order to have some common basis upon which metals of different density, sample size and immersed area can be compared, reference is made to a so-called, "Depth of Corrosion" figure, a discussion of which is to follow under the caption, "Tabulation of Results and Computation of the Theoretical Depth of Corrosion."

Method of Test-Preparation of Samples

The metals or alloys to be tested are usually received in sheet form from which sample strips are cut, having the approximate dimensions of six inches by two inches. The strip is accurately weighed on an analytical balance and this weight is recorded as the original weight of the sample. Determination of the density of the material is then made by ascertaining the exact volume of the sample strip. This is done by completely submerging the strip in water (the strip being suspended from one arm of the balance in the customary manner for determining density of solids) and noting its loss in weight as compared to the original weight in air, the loss being equal to the volume of the sample. The orginal weight of the sample in air divided by the difference between the weight of the strip in air and in water (volume) gives the density of the material.

Experience has shown that it is not advisable to completely submerge the metal in the gas condensate during the test, since it has been found that any corrosion which might occur is usually more severe at that part of the strip which just emerges from the condensate. This is perhaps to be attributed to a combined action of the air and the condensate on the metal at the water line. For this reason, it is advisable to allow about one inch of the strip to project out of the liquid. It is our practice to bend the strip about one inch from the top at an angle of about 45 degrees and this bent edge serves as a water line mark in filling the container which holds the sample. The total area of metal immersed is computed from the dimensions of the strip, width, thickness, and length, the latter dimension being measured from the bottom of the strip to the edge along which the bend was made, which is the length that will be actually submerged. In measuring the thickness of the metal, a micrometer is used and the average of several readings is taken.

Before immersing the sample in the condensate, the lower portion of the strip, at a point about two inches from the bottom, is folded back at an angie of 45 degrees (in an opposite direction to that of the first bend made). This lower folded portion is again bent at its mid-point until the bottom inch of the strip is parallel to the strip proper or until the lower part of the sample has the appearance of a capital "N". The purpose in doing this is to ascertain the extent to which disturbance of the grain structure of the metal, caused by bending, influences the rate at which corrosion normally occurs.

The strip is now ready for test. It is placed in a glass container, discarded battery jars prove quite satisfactory for this purpose, and condensate is added to reach the edge along which the strip was first bent. The metal is allowed to remain in the condensate for a period of one month, the condensate being kept at a temperature of about 150°F. by means of an electric hot plate. It is necessary to add condensate from time to time to replace that lost by evaporation and for this reason it is well to keep the Referee apparatus in continuous operation, so as to have an ample supply of the corrosive medium on hand. At the end of the month the strip is removed, washed with water, lightly brushed to remove any corrosion products that may have formed, dried and reweighed. Although a loss in weight will generally occur, oftentimes a gain in weight is noted. This is an indication that corrosion is taking place just as surely as in the case of a loss in weight and can be attributed to one of two things: the reaction of the metal with the sulphate contained in the condensate resulting in the formation of a salt which deposits upon the strip oftentimes as a hard incrustation, or by the oxidation of one or more of the metallic constituents of which the sample is composed.

Tabulation of Results and Computation of the Theoretical Depth of Corrosion

In writing up a monthly progress report on the test, the following items are recorded: the name of the metal or alloy, the density of the material, the period of immersion in months, the original weight, the weight of the sample strip at the time the report is made, the loss in weight of the strip which is the difference between the last two items, the total immersed area of the strip, and the depth of corrosion as computed from the formula:

$$\text{Depth of Corrosion in Inches} = \frac{\text{Loss in weight of strip in grams per square inch of immersed area}}{\text{Density of sample} \times 16.4}$$

The total immersed area is computed from the dimensions of the sample strip and is the summation of the following items:

Thickness of strip in inches x Width of strip in inches
2 x Width of strip in inches x Length of strip immersed in inches
2 x Thickness of strip in inches x Length of strip immersed in inches

The summation of the above figures gives the overall area in square inches of that part of the strip which is immersed and is referred to as the "Total Immersed Area."

The derivation of the depth of corrosion formula is obtained in the following manner:

If the total immersed area of the strip in square inches is multiplied by the theoretical depth of corrosion which we shall call "X," the volume of metal lost in cubic inches is obtained. This figure is converted to cubic centimeters by multiplying by 16.4. The result thus obtained when multiplied by the density of the sample strip gives the weight in grams equivalent to this volume. Since this weight is equal to the loss in weight which occurs in the sample strip, the following statement can be made:

Loss in Weight of sample in grams =
Total immersed area in sq. in. x depth of corrosion "X" x 16.4 x density

Which by rearrangement:

$$\text{Depth of Corrosion in inches} = \frac{\text{Loss in weight of sample in grams}}{\text{Total immersed area in sq. in.} \times \text{den.} \times 16.4}$$

Or:

$$\text{Depth of Corrosion in inches} = \frac{\text{Loss in weight in grams per sq. in.}}{\text{Density} \times 16.4}$$

SUMMARY OF ACCELERATED CORROSION TESTS ON VARIOUS METALS AND ALLOYS

Composition of Metal	*Laboratory Designation-Strip. No.*	*Immersion Period in Months*	*Depth of Corrosion in Inches*
	Non Ferrous Alloys		
Sheet Aluminum	1	22	$1.62 \times 10\text{-}4$
Sheet Aluminum	2	22	$1.37 \times 10\text{-}4$
Sheet Aluminum	32	14	$6.17 \times 10\text{-}4$
Sheet Copper	3	22	$.22 \times 10\text{-}4$
Sheet Copper	37	56	$2.92 \times 10\text{-}4$
Sheet Lead	34	32	$12.60 \times 10\text{-}4$
Lead Coated Copper	39	52	$3.53 \times 10\text{-}4$
Lead Coated Copper	48	3	Strip Gaining in Weight
Brass Cu 60; Zn 40	8	22	$.54 \times 10\text{-}4$
Cu 96; Si 3; Mn 1	9	22	$.73 \times 10\text{-}4$
Cu 88.1; Ni 5.35; Si 4.3	15	17	$3.14 \times 10\text{-}4$
Cu 95; Si 4; Mn 1	24	68	$8.51 \times 10\text{-}4$
	Iron and Steels		
Sheet Iron	10	15	$25.44 \times 10\text{-}4$
Cast Iron	13	20	$29.07 \times 10\text{-}4$
Ingot Iron (Fe 99.9)	16	16	$45.53 \times 10\text{-}4$
Ingot Iron (Fe 99.9)	17	16	$41.55 \times 10\text{-}4$
Copper Bearing Iron	45	3	$5.46 \times 10\text{-}4$
Copper Bearing Steel	11	22	$42.24 \times 10\text{-}4$
Copper Bearing Steel	12	22	$51.30 \times 10\text{-}4$
Copper Bearing Steel	19	16	$43.41 \times 10\text{-}4$
	Alloy Steels		
Cr 4-6; Balance Fe	41	12	$34.52 \times 10\text{-}4$
Cr 12-16; Ni .5; Balance Fe	6	22	$.08 \times 10\text{-}4$
Cr 12.5-18.5; Ni< .5; Balance Fe	23	14	$1.41 \times 10\text{-}4$
Cr 16.5-19.5; Ni 7-10; Balance Fe	27	68	$.20 \times 10\text{-}4$
Cr 17-20; Ni 7-10; Balance Fe	7	22	$.003 \times 10\text{-}4$
Cr 17-19; Ni 7-10; Balance Fe	33	10	$.28 \times 10\text{-}4$
Cr 17-19; Ni 7-10; Balance Fe	35	59	$.24 \times 10\text{-}4$
Cr 18; Ni 8; Balance Fe	47	3	$.004 \times 10\text{-}4$
Cr 22-25; Ni 10-13; Balance Fe	5	22	$.19 \times 10\text{-}4$
Cr 22-25; Ni 10-13; Balance Fe	29	68	$.004 \times 10\text{-}4$
Cr 26-30; Ni .6; Balance Fe	4	22	$.01 \times 10\text{-}4$
	Miscellaneous		
Ni 68; Cu 28; Fe 2	14	20	$1.33 \times 10\text{-}4$
Ni 68; Cu 28; Fe 1.9; Si 1.1	30	68	$17.58 \times 10\text{-}4$
Tantalum	40	51	Uneffected
Galvanized Iron	49	11	$1.77 \times 10\text{-}4$

The depth of corrosion figure is more hypothetical than real since in its determination the assumption is made that the loss which occurs in the weight of the strip is a uniform loss equally distributed throughout the entire immersed area of the sample. Such may or may not be the case, but in any event the figure does have value in that it affords a means whereby one metal may be compared with another on a common basis. It is obvious that such a comparison could not be made using, for example, the percentage loss in weight of the sample strip due to the difference in the density of the metals tested. A light metal, such as aluminum, might show a percentage loss in weight considerably less than a heavier metal, such as iron, and yet have corroded to a greater depth than the iron, due to the difference in density between the two materials.

Results of Test

The results obtained from tests made over a period of six years time on various metals are tabulated above. The duration of test period in months, it will be noted, is not the same for each of the metals

tested. In order to make a fair comparison between one metal and another, the period of immersion should, of course, be the same.

Some of the metals included in the accompanying table have been under test a comparatively short time, whereas others have been studied for more than five years. Rather than to report the depth of corrosion figure obtained for all of the metals at the end of three months' time, which is the length of time some of the metals have been under observation, it was felt to be more desirable to give the results which were obtained over the maximum length of time that each metal has been studied.

Trade names and manufacturer's names have been purposely omitted from the table for obvious reasons. The manufacturer's analysis of the metals has been used in all cases. In a number of instances, it will be noted that several sample strips of the same chemical composition have been reported. This is to be explained by the fact that some of the more standard types of metals were secured from different manufacturers.

Summary

The product resulting from the combustion of either manufactured gas or mixtures of manufactured gas and natural gas, when cooled to the point where condensation occurs, is highly corrosive towards most metals. Sulphuric acid formed by the combustion of small amounts of sulphur contained in the gas is perhaps responsible for the corrosive character of the condensate. A test to determine the metal or alloy must suitably be adapted to resist the action of flue gas condensate is described, and data which have been collected on a number of different metals over a period of six years' time are included in the report.

RECEIPT AND DISPATCH OF ORDERS

(Continued from page 29)

Supervision of Telephone Contacts

Mrs. Philadelphia can always expect intelligent and courteous treatment as her telephone contacts are sampled through Observation Cabinets. These sample contacts are invaluable in compiling training data, which are used continuously to improve our service.

She can also expect a prompt answer as the flow of traffic is indicated by these Observation Cabinets and also by the small signal cabinet shown in the foreground of figure 1. This latter apparatus shows at a glance, by light signals, whether or not there are sufficient representatives to handle the incoming traffic. Storage of ten seconds only is permitted. When calls are stored for more than ten seconds, the Supervisor immediately arranges for additional help.

Registration of Calls

In connection with the thirty-position turret is a battery of registers, one for each position, which record the incoming calls. From these records, data are compiled showing the number of employees required to operate the turret board during the various hours of the day. Also in this battery are registers which record the number of calls where answers are delayed ten seconds or more. These records have proved of value in compiling future working schedules.

Although the foregoing description is very brief, yet the many factors involved clearly indicate that the function of the Telephone Service Division is widespread.

The policy of the Company to maintain efficiency in the highest degree necessitated the installation of the most modern telephone equipment. Every day that this system has been in use it has increasingly proved its value in building up customer good-will, through the entire absence of irritating features so often connected with telephone inquiries of large companies.

Figure 3. Dispatching desk

Minerals Yearbook Published

PUBLICATION of the "Minerals Yearbook, 1935," is announced by the Bureau of Mines, Department of the Interior. The volume, containing 75 chapters, 129 illustrations, and nearly 1,300 pages, constitutes a condensed library of current developments in the mineral industries. It chronicles the production of a hundred commercial minerals in the United States and abroad during the year 1934. Technical progress in the production of these minerals and their present economic position are reviewed.

The "Minerals Yearbook, 1935," continues the advances made in its immediate predecessor and incorporates many improvements based on constructive suggestions volunteered by close observers and students of the mineral industry. In addition to accurate official data on all commercially important minerals, there is a resume of the principal economic developments in mining, as well as chapters dealing with progress in coal utilization, uses of petroleum fuels, petroleum and natural gas production, mine safety, and mineral developments from a world viewpoint.

Chapters on miscellaneous commercial gases and on minor nonmetallic minerals appear for the first time. Recommendations of the National Resources Board and activity under the National Recovery Administration are reviewed in the commodity discussions. An analysis of the extent of business recovery for various mineral groups is given.

Copies of the Yearbook, in blue cloth binding, may be purchased at a price of $2 from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Condensation in Chimneys

UNIVERSITY of Illinois, Department of Ceramic Engineering, Urbana, Illinois, announces the publication of a report known as Circular No. 22 which gives the results of tests to determine the amount of condensation in chimneys for manufactured gas and other fuels when used for house heating. The report covers a range of indoor-outdoor differences, as well as a wide range of firing rates.

Testing Laboratory

Requirements Committees' List Important Activities

CONTINUING its regular schedule of activities, the American Gas Association Approval Requirements Committee (A. S. A. Sectional Committee, Project Z21) and its various subcommittees will hold three important meetings in the first three months of 1936. Late in January a meeting of the Subcommittee on Approval Requirements for Gas Hair Dryers is to be held at the Cleveland Laboratories of the Association. Early February the Gas Range Subcommittee will convene at the same location for an important two-day session, and then, in March, a meeting of the A. G. A. Approval Requirements Committee will take place.

At the Hair Dryer Committee's session, all comments and criticism received from the industry on the Tentative Approval Requirements for Gas Hair Dryers printed and distributed in November will be considered. For an initial set of standards, the tentative requirements under consideration are so complete that few major changes are expected to be made, although the reactions of hair dryer manufacturers to certain proposed clauses specifying different types of safety and control accessories may form important points of discussion. If the standards are approved, either as they now exist or with minor modifications not involving further technical research, they will be in shape for submittal to the Approval Requirements Committee in March for final adoption.

Range Standards

The work to be executed by the Subcommittee on Approval Requirements for Gas Ranges in February will concern numerous changes in standards proposed to apply to the seventh edition of the gas range requirements which became effective January 1, 1936. A number of technical reports on gas range requirements research work conducted by the Testing Laboratories will be placed before the Range Committee at that time. These will involve chiefly matters of: Oven inputs and maintenance rates, top burner heat distribution, oven and top burner cooking speeds, and the effect of utensil size upon top burner efficiency. Most important, perhaps the Gas Range Committee will consider revisions of the requirements for ranges designed to use propane or other bottled gas supplies.

Several important matters are scheduled for final action at the hands of the general Approval Requirements Committee in March. Standards for semi-rigid gas appliance tubing and fittings approved last year by both the Approval Requirements Committee and the American Standards Association to go into effect January 1, 1936, but since shown to be indefinite in certain particulars and, therefore, modified accordingly, will be acted upon for the second time, and when approved by the American Standards Association will be published in final form. Extended by clauses insuring that listed fittings be capable of standing up in service on gas appliances, these standards will constitute a much firmer basis for beginning listing tests on such types of accessories.

Revised requirements for both gas space heaters and central heating gas appliances due for application on and after January 1, 1937, are also scheduled for official and final action by the Approval Requirements Committee in March. These two sets of modernized standards are offered as the result of last year's efforts of the Central Heating Gas Appliance and Gas Space Heater Subcommittees, which groups met last on October 18 and November 8, respectively, to review and act upon comments received from the industry.

Following the March Approval Requirements Committee meeting, therefore, it is expected that four sets of standards may be published in final form. Two of them, approval requirements for gas hair dryers and listing requirements for semi-rigid gas appliance tubing and fittings, will appear as first editions. The approval requirements for gas space heaters and approval requirements for central heating gas appliances to be printed will supersede those of the same titles which have been effective since July 1, 1934, and January 1, 1935, respectively.

New Water Heater Standards

THOROUGHLY revised and modernized American Standard Approval Requirements for Gas Water Heaters have been published recently by the Testing Laboratories and distributed to all manufacturers of gas water heaters, and other interested groups. These standards supersede the requirements which became effective July 1, 1934. On and after January 1, 1936, compliance with them will be mandatory in all pertinent Laboratory testing for approval. Furthermore, water heaters tested and approved during the year 1931, and which have not been retested under later requirements since that time, must, during the year 1936, be made to conform to the new stipulations in line with the 5-year approval plan adopted last year. Entire retest may or may not be necessary to ascertain such compliance.

The most significant change is perhaps that which elevates the minimum corrected thermal efficiency required of water-heating equipment from 65 to 70 per cent. Little hardship is worked upon the manufacturer of appliances by this revision since modern perfections in design and construction render the attainment of a 70 per cent efficiency a relatively simple matter. In fact, more exacting demands on the part of users of gas, coupled with competitive forces, have long urged appliance builders in this direction. The net result, of course, is to raise the general level of water heater manufacture.

In addition, the 1935 requirements are considerably more comprehensive than those of 1933. Every effort has been made to correlate the approval requirements for water heaters with the various new sets of listing requirements for gas appliance accessories. For example, many of the clauses of the American Standard Listing Requirements for: (1) Gas Burner Valves, (2) Draft Hoods, (3) Relief and Automatic Gas Shut-Off Valves, (4) Automatic Devices To Prevent Escape of Unburned Gas, (5) Thermostats, and (6) Pressure Regulators, were inserted bodily into the revamped water heater standards.

In other cases, where important requirements covering accessories were called for, although the listing standards as such were not suitable for the purpose, special stipulations were made so as to preclude any conflict between approval and listing specifications. As a result of such endeavor, both the number and variety of requirements placed upon the various kinds of safety and control accessories supplied with approved water

heating equipment, have been appreciably increased.

As regards protective features, certain accessories heretofore merely recommended for use have been made mandatory. Means of preventing both the production of excessive water temperatures and pressures are now definitely required on all storage types of heaters.

In this connection, the American Gas Association Approval Requirements Committee (A.S.A. Sectional Committee, Project Z21) has made certain rulings worthy of notation at this point. The requirement above mentioned would ordinarily only affect water heaters tested and approved after January 1, 1936. However, the Approval Requirements Committee considers the matter of such importance that it feels that all water heaters bearing the Laboratory Seal of Approval which are offered for sale should, irrespective of date of approval, incorporate pressure and temperature relief or shut-off valves. It has, therefore, decreed that the requirement involved, Part I, Sec. 8, clause "a" of the new standards, be made retroactive on January 1 of next year. All water heater manufacturers have been notified by mail of this action.

Correspondingly, a requirement which went into effect July 1, 1934, and which specified for the first time that all automatic water heaters be equipped with automatic devices to prevent escape of unburned gas (i.e., safety pilots), was made retroactive by the Approval Requirements Committee as of January 1, 1935. Hence, irrespective of the date of approval, certification will not now be continued upon any automatic storage gas water heater unless it is fitted with a satisfactory automatic device to prevent escape of unburned gas.

This illustrates the Association's position that, where considerations of safety or potential discrimination between competing manufacturers are involved, corrective rulings may be quickly made for immediate application, although it is not the general policy of either the American Gas Association or its Testing Laboratories to make additional compliance demands upon manufacturers of approved appliances before the proper five-year interval between retests has elapsed.

COMMERCIAL SECTION PROGRAM

(Continued from page 31)

Heating and Air Conditioning Committee. H. O. Loebell, Chairman, outlined the following program for his committee.

1. To review the elements which comprise the incremental cost of production, distribution and servicing, and the probable limits in which they lie. This problem to be assigned to the Technical Section.
2. To determine a uniform phraseology and definition of terms applicable to house heating activities and a method of accounting which meets these terms. To be assigned to the Accounting Section.
3. To determine what it has cost companies to secure present house heating saturations, correlated with local premiums and incomes.
4. To determine probable turnover of house heating customers and correlate with premium cost and local income.
5. To determine expenditures necessary to maintain house heating load.
6. To determine the advisability of using:
   a. Manually-controlled conversion equipment
   b. Power or blast burners
7. To determine results of house heating sales programs by months to see influence of seasonal periods.
8. To review air conditioning activities and determine the problems involved toward its promotion as a gas-using device.
9. To study results obtained and unit costs of full time selling organizations and part time selling organizations.

Space Heating

One of the principal activities of the Space Heating Committee, under the chairmanship of W. H. McInnis, Memphis Power and Light Company, Memphis, Tenn., is expected to be the correlation of information on the market for space heating and the various types of equipment available for this work, including unit heaters. It has been suggested that the committee consider the question of kitchen and parlor heating markets. Any new developments in space heaters during the year will be reported to the industry by the committee.

Window and Store Display

The Window and Store Display Committee plans to continue publication of an illustrated bi-monthly bulletin of outstanding window and store displays. In a recent discussion of the committee's activities, it was suggested that dealer displays receive separate treatment in special issues of the bulletin rather than as an integral part of each issue. Another project under consideration is a survey of those agencies in various parts of the country who are in a position to produce effective displays for companies who do not have their own production departments.

Executive Board Meeting

A REGULAR meeting of the Executive Board will be held at Association Headquarters in New York City on January 14. Members desiring to submit matters for consideration at this meeting are invited to address their communications to the Managing Director.

Regional Sales Conferences Planned

THREE of the regional sales conferences sponsored annually by the Commercial Section will be held during the month of February 1936. A strong program of sales topics has been arranged for each of these conferences and a half-day session on home service activities will be held on the last day of each conference.

The Eastern Natural Gas Sales Conference, under the chairmanship of George L. Scofield, Republic Light, Heat and Power Company, Buffalo, N. Y., will be held at the William Penn Hotel, Pittsburgh, Pennsylvania, February 6-8.

The Mid-West Regional Gas Sales Conference will be held at the Sherman Hotel, Chicago, Illinois, on February 13-15 with H. J. Dropp, Milwaukee Gas Light Company, Milwaukee, Wisconsin, presiding as chairman.

The Southern-Southwestern Regional Gas Sales Conference will be held in conjunction with the annual meeting of the Southern Gas Association at the Roosevelt Hotel, New Orleans, Louisiana, February 19-21. C. B. Wilson, Little Rock Gas and Fuel Company, Little Rock, Arkansas, is chairman in charge of the sales conference.

One person in every forty in the United States is either a stockholder or bondholder, or both, of a public utility.

Teller and Snyder Leave Laboratories

WILLIAM R. TELLER, engineer with the Cleveland Testing Laboratories of the Association for the past six years, has resigned to assume the duties of development engineer for The Hotstream Heater Company, Cleveland, Ohio. His work with the Laboratories included service in the testing, research and publications departments. Acting as one of the Laboratories' inspectors for several years, he became well acquainted with a large number of the appliance manufacturers throughout the country. His special interests have long been in the field of gas water heater performance.

Robert I. Snyder, holder of the Natural Gas Fellowship at the University of West Virginia for the year 1934-5 and Laboratories' engineer since 1932, with the exception of the time spent at the West Virginia University, resigned to accept a position in the gas distribution department of the Los Angeles Gas and Electric Company under W. M. Henderson.

Both Mr. Teller and Mr. Snyder are mechanical engineering graduates, the former having received his diploma from Case School of Applied Science in 1927, and the latter from the University of Michigan in 1932.

Personnel Service

SERVICES OFFERED

Controls and **gas burner engineer** wants position offering greater possibilities. Has several years' practical work in design, application and operation thermostatic and gas mixing controls or mechanical and electrical types, and gas burners all types. Fundamental training and experience, combustion, metallurgy, mechanics and electricity. **980.**

Sales Engineer having specialized in the sales and promotion of automatic gas water heaters for over 10 years. Planned and conducted many successful sales campaigns. Well acquainted with gas companies, plumbing supply houses and have arranged many eastern plumber dealer setups. **981.**

Specialist in problems pertaining to efficiency, operation and maintenance; well grounded in the fundamentals of fuel production, transmission and distribution. Have proven record for load building, new business and fuel application. Experience also covers appraisal, rates, selling and public relations; graduate engineer. **982.**

Accounting, Cost and **General.** Eight years' experience; gas plant, transmission and distribution system construction and operations analyzed. Ascertainment of cost, accounting of same determined in conformity with utility and public service commissions requirements. Field records gas works and main systems audited and accounting and statistical reports compiled. **983.**

Assistant Superintendent of coal gas plant desires position with a coke oven or coal gas plant in supervisory capacity. Three and one-half years university training in civil engineering; eight and one-half years' experience in coal gas plant. Familiar with plant construction work. (29) Married. **984.**

Presently employed. Available thirty days. Do you need a gas man who can get results? I am willing to prove it by a year's trial. Experienced thirteen years in gas business **sales promotion,** making friends, boosting sales, creating company good will; can help sales force get new business. **985.**

Manager. 20 years' experience managing water gas properties. 5 years' experience managing natural gas property. Experience includes all phases including distribution, new business and public relations. **986.**

Manager or **Superintendent.** Twenty years' practical experience handling properties having up to 4,000 meters. Water or coal gas plants. Have had good success in rebuilding run down properties. Would take living wage and share of profits, married (50). **987.**

Engineer experienced in following: Operation —coal and water gas plants—distribution and service department. Design—several water gas plants with equipment—coal gas condensing and purification equipment—high and low distribution systems. Construction —complete water and coal gas plants—remodeling plants; distribution. **988.**

Research Chemist—Several years' experience in a coke plant together with research and development work for a leading research corporation. Familiar with analyses of by-products and routine analytical methods. Now employed but desire a change. **990.**

Utilization and **Sales Engineer** long experience New York Metropolitan and adjacent area in house heating, water heating, restaurant and industrial work. Testing installation and servicing. **991.**

Gas Engineer desires new connection. Graduate chemical engineer. Fifteen years' experience in design, construction, operation and maintenance of Water Gas Plants and high-, medium- and low-pressure distribution systems. Able assistant or manager. **992.**

Gas range and Appliance **salesman** seeking substantial connection. Thoroughly experienced and capable of handling any territory. Have the ability to supervise and perform sales promotion duties. Will locate anywhere, no preference as to territory. Interested in salary and expenses or drawing account, commission and expenses. **993.**

Gas Engineer. Ten years operating all types of plants, various capacities from cadet to superintendent. Six years, gas manufacturing equipment company, last three chief engineer. Three years with public servic commission, valuation engineer. Experience ideal for holding or operating company engineer. **994.**

SERVICES OFFERED

Sales Manager—Sales Promotion Manager—Salesman—competent, aggressive, experienced,—for gas company or manufacturer wanting successful sales. Appliances, gas merchandise, gas distribution supplies, plumbing, heating specialities. 12 years' effective selling, promoting, advertising, managing volume sales for leading specialty manufacturers. National gas company executive, jobber and consumer contacts. **995.**

Office Manager (31) 3 years in company of 46,000 meters, 14 years' experience in clerical and accounting work, will accept position in any capacity—collector, accountant, storekeeper, payroll work, etc. Married. **996.**

Industrial Sales Engineer:—Several years' experience in supervising the sales, installations and maintenance of house heating, industrial steam and water heating. Special training and knowledge derived from long experience with eastern utility companies will be a great asset to any corporation. **997.**

Gas minded, practice trained water gas plant man (39). Experience ranged from sole operator 4-foot plant to assistant **superintendent** of a 3½ million daily plant. Also experienced as general foreman of distribution construction, mains and services. **999.**

Energetic efficiency gas man with **twenty** years' experience, operating and managing, desires change from present position, to that of **manager** or **superintendent** of medium sized utility or assistant to manager of large one. Knowledge of sales problems. Single, college, go anywhere. (39). **1000.**

Gas Technologist—Young man (34) with broad experience in gas industry as manufacturing and distribution engineer, operator and designer of equipment, desires responsible position where valuable engineering and business experience can be put to use. **1001.**

Sales Engineer, thoroughly experienced in new business operations of gas utility, domestic appliances, house heating and industrial application, wants position where there is chance for advancement. **1002.**

Engineer (27) B. S. Chemical Engineering 1932; 1-year graduate study. Experience: 18 months automotive industry; 3 months gas pipeline; 22 months gas appliance industry where now employed. **1003.**

Sales **Supervisor** or Sales **Engineer.** Have had considerable experience in industrial, commercial, house heating and domestic sales work. Also am familiar with design and installation of equipment. Have worked with manufactured and natural gases. **1004.**

Kitchen **Equipment Salesman.** Desires connection with well-established hotel and restaurant kitchen equipment house. Twenty-five years' experience designing and selling kitchen equipment in and around New York City, through architects and builders. Thoroughly familiar with all gas appliances for heavy duty work in kitchens. **1005.**

Thoroughly seasoned and competent **sales manager** able to handle any or all divisions of commercial and public relations departments. Several outstanding records in water heating, commercial and industrial work. Can get volume business in any territory and produce satisfying results. **1006.**

Auditor: Age 30, University graduate in 1927, accounting major. Three years' public accounting on public utility staff, three years with large holding corporation, supervising property accounting for thirty-two gas properties. Assistant general auditor. **1007.**

Engineer with utility accounting experience. B. S., M. E. E.; postgraduate work. Three years' research assistant, National Industrial Conference Board. Twelve years' gas and electric utility experience, rates, franchises, cost allocations, contracts, research in utility management problems. Experience with P. S. C. accounting. (N. Y.). **1008.**

Practical and technical **gas engineer**—thirteen years' experience design, layout, development, estimating, advertising, selling and appraisal of gas plants and equipment. Also competent structural design. **1010.**

Graduate Engineer with twelve years' experience in the gas business; assistant superintendent of large water gas plant, estimating costs for construction and alteration of coke and gas plants, physical inventories and appraisals, desires position in operating or construction department, married, (35). **1011.**

SERVICES OFFERED

Practical, technically trained man seeks opportunity in industrial **gas burner** and **appliance** field with manufacturer or utility. Experience includes making, testing, developing industrial burners and appliances; traveled several years supervising installations. Likes to travel, will go anywhere. Last five years industrial salesman. **1013.**

Semi-Senior **Accountant** for three years—public utility staff—accounting firm, then three years as special accountant with large electric and gas corporation until they went into receivership. Auditor of disbursements for large corporation board, thorough experience in all departments. (30). **1014.**

Engineer—Broad experience. Three years in valuation:—appraisals, reports, and property records. Three years in heating and ventilating:—research, design and installation. Supervision of coal and water gas production and distribution. Design, construction, estimates, expert operation and research. Graduate; advanced engineering degree. **1015.**

Utility Executive available: have had 25 years' experience in all branches of utility business, organization, financing, construction, operation and utilization. Recently vice-president in charge of sales of large holding company, selling gas, electricity, water, ice, fuel, merchandise and securities through local operating companies. **1016.**

Experienced **Sales Engineer** (ME) having broad background of gas and other industries; have designed, purchased, operated and sold plant equipment. Essentially practical yet have vision, iniative and creative ability; specialist in gas measurement on which much original work accomplished. **1017.**

Engineer, Graduate M. E. 20 years' experience in electric utility, manufactured and natural gas, appraisal valuations, previously manager, general superintendent and engineer for operating company, temporarily employed. **1018.**

Insurance Specialist: graduate engineer, experienced utilities, operating and holding company, meter reader to junior executive; now employed, specialized last five years in producing large economies in insurance protection of all kinds for utility companies. Available special reports or full time. **1019.**

Fifteen years, practically all spent in the design, construction, and **appraisal** of manufactured gas plants and distribution systems have suitably fitted an engineering graduate for twenty or more additional years of conscientious, competent service to the employer who can offer a future. Available now. **1020.**

Geologist, valuation engineer—University education; many years' experience with largest producer in Appalachian fields, know producing sands, depths, rock pressures, depletion. Also valuation expert on mechanical equipment inventory for gas plants. Statistician and chart experience. (38). **1021.**

POSITIONS OPEN

One of the old line water heater manufacturers requires salesman to call on utilities and jobbers. Must have previous experience. Good territories open. **0297.**

Large Manufacturer popular priced gas ranges has opening for **salesman** in two territories midwest and east. State previous selling experience. **0298.**

District Manager, 30 to 40, well educated, with thorough knowledge fundamentals of salesmanship and ability to advance. Must know selection, training and supervision sales personnel, maintenance good customer and dealer relations and have had promotional sales experience. Previous retail sales work with gas appliances essential. **0300.**

XMAS CHEER FOR SOMEONE!

December 18, 1935

Please discontinue the "Position Open" Classification you ran for us. . . . Through this medium we have contacted a party with the qualifications we were looking for and it looks as though the service you have rendered will be of mutual benefit.

Advisory Council

H. C. ABELL.....New Orleans, La.
JAY BARNES.....New Orleans, La.
HOWARD BRUCE.....Baltimore, Md.
FRANK L. CHASE.....Dallas, Texas
A. S. CORSON.....Philadelphia, Pa.
J. D. CREVELING.....New York, N. Y.
F. C. FREEMAN.....Providence, R. I.
R. W. GALLAGHER.....New York, N. Y.
O. S. HAGERMAN.....Chicago, Ill.
C. A. HARRISON.....New York, N. Y.
W. H. HODGE.....Chicago, Ill.
SAMUEL INSULL, JR.....Chicago, Ill.
F. B. JONES.....Pittsburgh, Pa.
D. F. KAHN.....Hamilton, Ohio
F. A. LEMKE.....Kalamazoo, Mich.
F. A. MILLER.....Bradford, Pa.
W. F. MILLER.....Chicago, Ill.
E. B. NUTT.....New York, N. Y.
CLIFFORD E. PAIGE.....Brooklyn, N. Y.
I. K. PECK .....Binghamton, N. Y.
A. E. PEIRCE.....Warrenton, Va.
J. A. PERRY.....Philadelphia, Pa.
J. F. QUINN.....Brooklyn, N. Y.
GEO. W. RATCLIFFE.....Pittsburgh, Pa.
J. M. ROBERTS.....Chicago, Ill.
F. M. ROSENKRANS.....Kansas City, Mo.
N. T. SELLMAN.....New York, N. Y.
ARTHUR STOCKSTROM.....St. Louis, Mo.
D. B. STOKES.....Burlington, N. J.
T. J. STRICKLER.....Kansas City, Mo.
J. B. TONKIN.....Pittsburgh, Pa.
F. S. WADE.....Los Angeles, Calif.
T. R. WEYMOUTH.....Pittsburgh, Pa.
E. L. WILDER.....New York, N. Y.

AFFILIATED ASSOCIATIONS

Canadian Gas Association
Pres.—John Keillor, British Columbia Electric Railway Co., Ltd., Vancouver, B. C.
Sec.-Tr.—G. W. Allen, 21 Astley Avenue, Toronto.

Empire State Gas and Electric Association
Pres.—E. R. Acker, Central Hudson Gas & Electric Co., Poughkeepsie, N. Y.
Chairman, Gas Section—R. R. Bogie, Kings County Lighting Co., Brooklyn, N. Y.
Sec.—C. H. B. Chapin, Grand Central Terminal, New York, N. Y.

Illinois Public Utilities Association
Pres.—A. D. Mackie, Central Illinois Light Co., Springfield, Ill.
Sec.—Jack Abbey, 607 Leland Office Bldg., Springfield, Ill.

Indiana Gas Association
Pres.—R. N. Zeek, Northern Indiana Public Service Co., Michigan City, Ind.
Sec.-Tr.—P. A. McLeod, New Castle, Ind.

Michigan Gas Association
Pres.—D. H. Frazer, Jr., Battle Creek Gas Co., Battle Creek, Mich.
Sec.-Tr.—A. G. Schroeder, Grand Rapids Gas Light Co., Grand Rapids, Mich.

Maryland Utilities Association
Pres.—W. A. Tobias, Hagerstown Light & Heat Co., Hagerstown, Md.
Sec.—W. J. Lank, 10th and E. Streets, Washington, D. C.

Mid-West Gas Association
Pres.—Frank H. Brooks, Northern Natural Gas Co., Omaha, Neb.
Sec.-Tr.—Roy B. Searing, Sioux City Gas & Electric Co., Sioux City, Iowa.

Missouri Association of Public Utilities
Pres.—C. E. Michel, Union Electric Light & Power Co., St. Louis, Mo.
Sec.-Tr.—N. R. Beagle, Missouri Power & Light Co., Jefferson City, Mo.
Asst. Sec.—Jesse Blythe, 103 West High St., Jefferson City, Mo.

New England Gas Association
Pres.—R. H. Knowlton, The Connecticut Light & Power Co., Hartford, Conn.
Exec. Sec.—Clark Belden, 41 Mt. Vernon St., Boston, Mass.

New Jersey Gas Association
Pres.—Herbert E. Cliff, Public Service Electric & Gas Co., Newark, N. J.
Sec.-Tr.—G. B. Webber, Public Service Electric and Gas Co., Newark, N. J.

Ohio Gas and Oil Men's Association
Pres.—Harry F. Moran, Ohio Oil Co., Findlay, Ohio.
Sec.-Tr.—Frank B. Maullar, 811 First National Bank Bldg., Columbus, Ohio.

Oklahoma Utilities Association
Pres.—W. B. Head, Jr., Oklahoma Power and Water Co., Sands Springs, Okla.
Mgr.—E. F. McKay, 1020 Petroleum Bldg., Oklahoma City, Okla.

Pacific Coast Gas Association
Pres.—H. M. Crawford, Pacific Gas & Electric Co., San Francisco, Calif.
Mang. Dir.—Clifford Johnstone, 447 Sutter St., San Francisco, Calif.

Pennsylvania Gas Association
Pres.—Edward W. Ehmann, Philadelphia Electric Co., Ardmore, Pa.
Sec.—Frank W. Lesley, Pennsylvania Gas & Electric Co., York, Pa.

Pennsylvania Natural Gas Men's Association
Pres.—T. B. Gregory, Union Heat & Light Co., Pittsburgh, Pa.
Sec.-Tr.—B. H. Smyers, Jr., 435 Sixth Ave., Pittsburgh, Pa.

Southern Gas Association
Pres.—C. B. Gamble, Birmingham Gas Co., Birmingham, Ala.
Sec.-Tr.—S. L. Drumm, New Orleans Public Service Inc., New Orleans, La.

The Public Utilities Association of Virginia
Pres.—T. Justin Moore, Va. Elec. & Power Co., Richmond, Va.

Wisconsin Utilities Association
Pres.—G. V. Rork, Northern States Power Co., Eau Claire, Wis.
Exec. Sec.—A. F. Herwig, 135 West Wells St., Milwaukee, Wis.

AMERICAN GAS ASSOCIATION, Inc.

HEADQUARTERS, 420 LEXINGTON AVENUE, NEW YORK, N. Y.

OFFICERS AND DIRECTORS

President	L. B. DENNING	Dallas, Texas
Vice-President	HERMAN RUSSELL	Rochester, N. Y.
Vice-President	N. C. McGOWEN	Shreveport, La.
Treasurer	J. F. ROONEY	New York, N. Y.
Managing Director	ALEXANDER FORWARD	New York, N. Y.
Assistant Manager	H. W. HARTMAN	New York, N. Y.
Secretary	KURWIN R. BOYES	New York, N. Y.
Director, Publicity-Advg.	C. W. PERSON	New York, N. Y.
Departmental Vice-Pres.	WM. MOELLER, JR.	Los Angeles, Calif.
Sectional Vice-Pres.	F. L. GRIFFITH	Chicago, Ill.
Sectional Vice-Pres.	C. E. BENNETT	Pittsburgh, Pa.
Sectional Vice-Pres.	CHARLES W. GALE	Knoxville, Tenn.
Sectional Vice-Pres.	JOHN A. FRY	Detroit, Mich.
Sectional Vice-Pres.	F. A. LYDECKER	Newark, N. J.
Chairman, Pub. & Advg. Com.	HENRY OBERMEYER	New York, N. Y.

WALTER C. BECKJORD	Pittsburgh, Pa.	ARTHUR HEWITT	Toronto, Canada
H. O. CASTER	New York, N. Y.	GEORGE S. HAWLEY	Bridgeport, Conn.
C. M. COHN	Baltimore, Md.	C. W. HUNTER	Philadelphia, Pa.
H. C. COOPER	Pittsburgh, Pa.	CONRAD N. LAUER	Philadelphia, Pa.
ADDISON B. DAY	Los Angeles, Calif.	B. J. MULLANEY	Chicago, Ill.
J. S. DEHART, JR.	Newark, N. J.	W. T. RASCH	New York, N. Y.
B. J. DENMAN	Chicago, Ill.	THOS. E. ROACH	Tacoma, Wash.
H. L. DOHERTY	New York, N. Y.	W. FRANK ROBERTS	Baltimore, Md.
O. H. FOGG	New York, N. Y.	P. S. YOUNG	Newark, N. J.

SECTION AND DEPARTMENT OFFICERS

NATURAL GAS—Chairman	WM. MOELLER, JR.	Los Angeles, Calif.
Vice-Chairman	GEORGE E. WELKER	Oil City, Pa.
Secretary	A. E. HIGGINS	Dallas, Texas
ACCOUNTING—Chairman	F. L. GRIFFITH	Chicago, Ill.
Vice-Chairman	E. J. TUCKER	Toronto, Ont., Can.
Secretary	H. W. HARTMAN	New York, N. Y.
COMMERCIAL—Chairman	C. E. BENNETT	Pittsburgh, Pa.
Vice-Chairman	F. M. BANKS	Los Angeles, Calif.
Secretary	J. W. WEST, JR.	New York, N. Y.
INDUSTRIAL GAS—Chairman	CHARLES W. GALE	Knoxville, Tenn.
Vice-Chairman	RALPH L. MANIER	Syracuse, N. Y.
Secretary	EUGENE D. MILENER	New York, N. Y.
MANUFACTURERS—Chairman	JOHN A. FRY	Detroit, Mich.
Vice-Chairman	MERRILL N. DAVIS	Bradford, Pa.
Vice-Chairman	J. SCOTT FOWLER	Philadelphia, Pa.
TECHNICAL—Chairman	F. A. LYDECKER	Newark, N. J.
Vice-Chairman	M. I. MIX	Chicago, Ill.
Secretary	H. W. HARTMAN	New York, N. Y.
PUBLICITY & ADVERTISING COMMITTEE—Chairman	HENRY OBERMEYER	New York, N. Y.

PRINTED IN THE U. S. A.